

MHATT CAT
ENVIRONMENTAL, SAFETY, & HEALTH PLAN

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ABBREVIATIONS AND DEFINITIONS

ALARA.....	As low as reasonably achievable
ANL	Argonne National Laboratory
ANL <i>ES&H Manual</i>	The ANL- <i>East Environment, Safety and Health Manual</i>
APS	Advanced Photon Source
ASME	American Society of Mechanical Engineers
CAT.....	Collaborative Access Team
CDC-NIH.....	Centers for Disease Control and Prevention–National Institutes of Health
CFR.....	Code of Federal Regulations
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EPA.....	U.S. Environmental Protection Agency
ESH.....	Argonne National Laboratory’s Environment, Safety and Health Division
ESH-HP.....	The Health Physics Section of Argonne National Laboratory’s Environment, Safety and Health Division
ESH-IH&S	The Industrial Hygiene and Safety Section of Argonne National Laboratory’s Environment, Safety and Health Division
ESH-DA.....	The Dosimetry Analysis Section of Argonne National Laboratory’s Environment, Safety and Health Division
ES&H.....	General abbreviation for “environment, safety and health”
HazCom	Hazard Communication, particularly the OSHA Hazard Communication Standard, 29 CFR 1910.1200
ISM	Integrated safety management, a management
LCA.....	Laser Controlled Area
LOM.....	Laboratory/Office Module
MHATT CAT	University of Michigan, Howard University, Lucent Technology Collaborative Access Team
MSDS.....	Material Safety Data Sheet—A synopsis of safety- and health-related product information required under OSHA’s HazCom rule
NEC.....	National Electrical Code (NFPA 70)
NFPA	National Fire Protection Association

OSHA.....	Occupational Safety and Health Administration, a bureau of the U. S. Department of Labor
PPE.....	Personal protective equipment
RCRA.....	Resource Conservation and Recovery Act, a law administered by the EPA and various states, including Illinois
SAA.....	Satellite Accumulation Area
XFD.....	The Experimental Facilities Division of the Advanced Photon Source
Principal Investigator	Any MHATT CAT member, Independent Investigator, or other MHATT CAT-authorized individual who is designing, building, or performing an experiment at a MHATT CAT beamline.
MHATT CAT Personnel..	MHATT CAT members and staff and all other individuals who work at MHATT CAT's Facilities at the APS under MHATT CAT auspices.
Visitor	A person who has been invited by MHATT CAT personnel to spend time at MHATT CAT facilities, but who is not a Principal Investigator.

1. INTRODUCTION

1.1. SAFETY PROGRAM OVERVIEW

The University of Michigan, Howard University, Lucent Technologies and the MHATT Collaborative Access Team (CAT) is committed to creating and maintaining a safe research environment at the Advanced Photon Source (APS); that is, one that does not pose significant risk of injury or ill-health to humans or the environment. This document describes MHATT CAT's plans for achieving these objectives by controlling hazards and reducing risks to acceptable levels. Specifically, MHATT CAT will:

- Comply with relevant standards and adhere to practices and procedures mandated by the Advanced Photon Source;
- Identify and evaluate the hazards at each stage of beamline development, from beamline construction to operations and decommissioning;
- Incorporate engineered hazard controls into the design of the equipment and facilities MHATT CAT uses at the APS;
- Develop procedures that take full advantage of these engineered controls;
- Develop training programs that enable MHATT CAT members and visitors to use the engineered and procedural hazard controls effectively in creating a safe work environment; and
- Provide MHATT CAT personnel with the support needed to promptly identify and resolve safety issues.

To preserve the effectiveness of the engineered and procedural hazard controls MHATT CAT provides, all individuals using MHATT CAT's facilities will:

- Report all physical, chemical, biological, or energy-related hazards anticipated or encountered while using MHATT CAT facilities;
- Make proper use of all engineered and procedural hazard controls provided by MHATT CAT;
- Properly operate and maintain all sector equipment;
- Adhere to all prescribed work procedures;
- Avoid actions that will increase the risk of injury, illness, or damage to the environment;
- Promptly report evidence that an established hazard control has become ineffective; and
- Observe good housekeeping practices.

MHATT CAT reserves the right to suspend the activities or revoke the research privileges of any person within its purview who disregards or attempts to circumvent these requirements.

1.2. GENERAL POLICIES

MHATT CAT shall give highest priority to protecting the health and safety of its members, other users of the APS, visitors, ANL personnel, and the general public—and shall take all reasonable measures to prevent accidental damage to property and the environment.

It is MHATT CAT's policy that no shielding or personnel safety system installed by the APS or included in an APS-approved configuration shall be modified, removed, or disabled and that no equipment, system, or apparatus shall be operated outside of its designed safety parameters without a formal review by the applicable XFD safety committees and the written approval of the XFD Associate Division Director for Operations.

It is MHATT CAT's policy that no person shall be inside a MHATT CAT first optics enclosure or experiment station when all the doors to that enclosure/station are closed.

MHATT CAT will provide all MHATT CAT personnel (i.e., MHATT CAT members and all other individuals who work at MHATT CAT's facilities at the APS under MHATT CAT auspices) with an introductory safety orientation that will describe this safety program and stress the importance of complying with the environmental, safety, and health policies and practices described in this document and the ES&H documents of the respective MHATT CAT member institutions, the XFD and ANL *ESH Manuals*, and the *APS Conduct of Operations Manual*. This plan is intended to supplement those documents; however, wherever policies or practices differ among the various documents, MHATT CAT will observe the most protective requirements. MHATT CAT expects its personnel to inform the MHATT CAT Safety Coordinator of hazards not covered by any of the above-mentioned documents.

MHATT CAT expects that its members and guests will:

- Complete required safety training before performing any work;
- Plan their work in advance, giving sufficient consideration to hazards and the controls needed to reduce risks to acceptable levels;
- Comply with job-specific safety requirements;
- Comply with protective equipment requirements;
- Remain outside demarcated areas unless both properly protected and authorized to enter; and
- Refuse to perform hazardous work when that work requires individuals to remain out of visual or audio range of other persons for more than a few moments.

1.3. ORGANIZATION OF DOCUMENT

The rest of this document has been divided into the following parts:

Chapter 2: Program Administration. Defines how MHATT CAT will administer its safety program.

Chapter 3: Hazard Evaluation. Identifies anticipated hazards and defines, in general terms, the steps that MHATT CAT will take to control these hazards.

Chapter 4: Safety Guidance, Practices, and Procedures. Describes the procedures (designated "MHATT CAT Guidelines") that MHATT CAT will use to control hazards. The procedures that are mandated by the APS have been incorporated verbatim. Those procedures that were developed by MHATT CAT have incorporated requirements mandated by the APS, wherever they apply.

2. PROGRAM ADMINISTRATION

2.1. ORGANIZATIONAL STRUCTURE AND RESPONSIBILITIES

MHATT CAT has identified and evaluated the hazards its personnel are likely to encounter during operations in its spaces at the APS. This analysis and the practices mandated by the APS have led to the following assignments of MHATT CAT responsibilities. (Key personnel assignments are listed in Chapter 4 of this document.)

DIRECTOR

The MHATT CAT Director has the ultimate responsibility within MHATT CAT for ensuring that the safety, health, and environmental protection components of this program embrace all of MHATT CAT's activities at the APS, including the experimental work performed by Independent Investigators and MHATT CAT members. Although the MHATT CAT Director may delegate implementation of aspects of the program, the Director remains directly responsible for the program's continued effectiveness and for initiating corrective actions when required.

SECTOR MANAGER

The MHATT CAT Sector Manager reports to the MHATT CAT Director and has the primary day-to-day responsibility for maintaining safe conditions in all spaces occupied by MHATT CAT at the APS. This responsibility includes ensuring that the work performed by MHATT CAT members, guests, and on-site contractors providing services under MHATT CAT auspices remains in accordance with the provisions of this program. The Sector Manager works closely with the MHATT CAT Safety Coordinator in identifying and resolving safety and environmental issues involving MHATT CAT personnel and which arise as the result of interactions between MHATT CAT personnel and other personnel at the APS. The Sector Manager provides oversight to the other MHATT CAT safety coordinators and sees to it that MHATT CAT personnel properly execute the safety-related responsibilities assigned to them. The Sector Manager is MHATT CAT's primary contact with the APS on environmental, safety, and health issues. The MHATT CAT Sector Manager is responsible for maintaining records related to safety and environmental protection at MHATT CAT facilities. The MHATT CAT Sector Manager has the authority to stop any MHATT CAT activity judged to be unsafe or environmentally unsound. The Sector Manager is also responsible for the adequacy of accident and incident investigations.

SAFETY COORDINATOR

The MHATT CAT Safety Coordinator works closely with the MHATT CAT Sector Manager to ensure that day-to-day operations are carried out in accordance with the practices and policies covered by this plan. The Safety Coordinator sees to it that MHATT CAT principal investigators and visitors complete their required training and fulfill their safety-related responsibilities. The Safety Coordinator is MHATT CAT's primary contact with MHATT CAT Principal Investigators and visitors on environmental, safety, and health issues. The Safety Coordinator provides oversight to the MHATT CAT Laboratory Safety Captains. The Safety Coordinator is responsible for maintaining safe, neat, and orderly operations at

MHATT CAT's beamlines. This includes ensuring that preventive maintenance activities take place on schedule. The Safety Coordinator also:

- Ensures that any hazardous conditions created by Principal Investigators are corrected as soon as they are discovered;
- Ensures that there is an adequate inventory of safety-related supplies and equipment that are appropriate for use at MHATT CAT's beamlines;
- Assists with radiation surveys performed by ANL Health Physics personnel;
- Ensures that MHATT CAT's radiation survey instruments are in good working order and in calibration;
- Ensures prompt correction of safety and environmental protection deficiencies associated with beamline operation;
- Brings issues outside his/her scope of expertise to the attention of the MHATT CAT Sector Manager;
- Performs shielding inspections and radiation surveys on a regular basis and at the start of each experiment; and
- Supplies the MHATT CAT Sector Manager with copies of all safety inspection reports.

(See applicable MHATT CAT Guidelines.)

CHEMICAL SAFETY COORDINATOR

The MHATT CAT Chemical Safety Coordinator is MHATT CAT's Chemical Hygiene Officer, and as such is responsible for assisting in identifying and implementing proper controls for the hazards associated with chemicals, gases, and nonbiological samples. In particular, the Chemical Safety Coordinator participates in all inspections of chemical storage areas to help ensure that all safety-related equipment stocked by the MHATT CAT is appropriate for its intended uses. The Chemical Safety Coordinator is responsible for MHATT CAT's compliance with all mandatory APS requirements regarding the labeling and tracking of all chemicals, gases, and nonbiological samples in MHATT CAT spaces at the APS. (See Section 3.1 and *MHATT CAT Guidelines for the Management of Chemicals*.) The Chemical Safety Coordinator also takes steps to ensure that all wastes—particularly chemical wastes—are disposed of in accordance with APS requirements. (See *MHATT CAT guidelines for Management of Hazardous Waste*.)

ELECTRICAL SAFETY COORDINATOR

The Electrical Safety Coordinator is responsible for ensuring that all MHATT CAT personnel adhere to safe electrical design criteria and work practices. (See Section 3.2 and *MHATT CAT Guidelines for Electrical Safety Work Practices*.) To carry out these responsibilities, the Electrical Safety Coordinator:

- Reviews proposed experiments to verify that adequate safeguards will be in place to control electrical hazards;

- Inspects electrical equipment to be used during experiments and temporary electrical installations to verify adherence to electrical safety design criteria;
- Verifies compliance with ANL lockout and tagout procedures when these are required to control hazardous electrical energy;
- Reviews and approves the procedures MHATT CAT personnel are to follow when working hot (electrically)—that is, working on or near electrically energized components that have a potential of 50 volts or greater to ground—and
- Maintains clear and comprehensive records regarding electrical utilities, grounding diagrams, signal cables, etc., for all of MHATT CAT's facilities at the APS.

SHOP SAFETY COORDINATOR

The MHATT CAT Shop Safety Coordinator is responsible for the safe operation and maintenance of the LOM User shop (see *MHATT CAT Guidelines for LOM Shop Usage*). The MHATT CAT LOM Shop Safety coordinator will:

- Notify the Floor Coordinator, in advance of installation, about machine tools (and other equipment and furnishings) the CAT proposes to add to the LOM shop or to use elsewhere at the APS;
- Arrange for a shop inspection by the XFD ES&H Coordinator (or his designee), prior to putting the shop into service;
- Arrange for an inspection by the XFD ES&H Coordinator (or his designee), of each new machine to be added to the shop;
- Conduct monthly machine shop inspections using the Machine Shop Inspection Checklist (see *MHATT CAT Guidelines for Inspections*); and
- Provide candidates for machine tool authorization with an orientation to available machine tools.

LASER SAFETY COORDINATOR

The MHATT CAT Laser Safety Coordinator is responsible for assisting in identifying and implementing proper controls for the hazards associated with the use of Class III and Class IV lasers. The Laser Safety Coordinator is responsible for ensuring that all MHATT CAT personnel follow procedures designed to control laser hazards. At this time, MHATT CAT operates a CLASS IV laser in hutch 7-ID-D and has developed guidelines for safe operation of that facility (see *MHATT CAT Guidelines for Laser Controlled Area, 7-ID-D*). The Laser Safety Coordinator is responsible for ensuring that those guidelines are carried out.

LABORATORY SAFETY CAPTAINS

MHATT CAT Laboratory Safety Captains report to the MHATT CAT Safety Coordinator and are responsible for maintaining safe, neat, and orderly operations in the laboratories at MHATT CAT's sector. Their responsibilities are listed below:

General Safety Responsibilities

- Ensure that all reasonable precautions are taken to minimize the safety, health, and environmental risks associated with activities being performed in the laboratory spaces.
- Maintain an adequate inventory of personal protective equipment, as specified in the Laboratory Information Binder, for both visitors and MHATT CAT personnel. (See *MHATT CAT Guidelines for LOM Laboratory Information Binders*.)
- Order an immediate halt to any activity that creates an imminent danger to life, health, or the environment. Where appropriate, the Laboratory Safety Captain will also order the actions needed to abate the hazardous conditions resulting from the activity. Once a safe work environment has been reestablished, the Laboratory Safety Captain will report the incident to the MHATT CAT Sector Manager and Safety Coordinator. If neither is present, the incident will be reported to the responsible party's supervisor or escort. In the absence of all these individuals, the report will be made to the MHATT CAT Director.
- Quickly address the action item lists issued by the safety-related committees discussed below or by the MHATT CAT Safety Coordinator, and inform the MHATT CAT Safety Coordinator when the actions have been completed.
- Ensure that personnel using the laboratory are properly trained in the use of the laboratory's equipment and facilities.
- Maintain a list of the hazards found in the laboratory. This responsibility includes helping to maintain an inventory of the chemicals on hand. (See Section 3.1 and *MHATT CAT Guidelines for the Management of Chemicals*.)
- Ensure that required periodic inspections of safety-related equipment (such as eyewashes) and facilities (such as Satellite Accumulation Areas for hazardous wastes) are performed on schedule. (See *MHATT CAT Guidelines for Inspections*.)
- Maintain the Laboratory Information Binder described below. (See *MHATT CAT Guidelines for Laboratory Information Binders*.)

Chemical Laboratory Hazard Control

The Laboratory Safety Captain assigned to a chemical laboratory will also:

- Assist in identifying the proper handling procedures for the chemicals (including compressed gases and cryogenic liquids) and chemical wastes used or produced in the laboratory;
- Provide all MHATT CAT personnel with an orientation on the safety practices at the laboratory;

- Ensure, with the support of the MHATT CAT Safety Coordinator or Chemical Safety Coordinator, that all safety and protective equipment used in the laboratory are functioning properly and are appropriate for the materials being handled;
- Track all chemicals, gases, and chemical wastes used or produced in the laboratory; and
- Review the chemical, gas, and chemical waste storage areas monthly, keeping a log of the areas inspected, the inspection dates, any findings, and any actions taken. (See *MHATT CAT Guidelines on Management of Chemicals*, *MHATT CAT Guidelines for Personal Protective Equipment*, *MHATT CAT Guidelines for Management of Hazardous Waste*, and *MHATT CAT Guidelines for Inspections*.)

Sealed Source Hazard Control

The Laboratory Safety Captain assigned to a laboratory that uses sealed radioactive sources will have the additional responsibility of being the source custodian. As custodian, the Safety Captain will ensure that ANL and APS requirements for inventorying, storage, and use of sealed sources are met. (See Section 3.3 and *MHATT CAT Guidelines for the Management of Sealed Radioactive Calibration Sources*.)

SAFETY COMMITTEE

The MHATT CAT Safety Committee reports to the MHATT CAT Director, who selects its members and chairperson. The MHATT CAT Sector Manager is a permanent member; the others are MHATT CAT members who serve for 2 year terms that end at different times. The MHATT CAT Director may designate additional individuals to serve as temporary committee members because of their special expertise.

The MHATT CAT Safety Committee will conduct experiment safety reviews and grant approval for experiments to be performed at the MHATT CAT APS facility. (See *MHATT CAT Guidelines for Experiment Safety Review*.)

The Committee is responsible for conducting quarterly ES&H inspections of MHATT CAT's facilities at the APS using the Quarterly Safety Inspection checklist. (See *MHATT CAT Guidelines for Inspections*.) It also reviews proposed experiments that require engineered or procedural safeguards that are not in place at MHATT CAT's facilities.

The MHATT CAT Safety Committee has the authority to suspend any activity at MHATT CAT's facilities that fails to comply with ES&H requirements or which significantly deviates from good laboratory practices. The Committee will immediately notify the MHATT CAT Director and the MHATT CAT Safety Coordinator when suspending an activity. If the Committee considers it appropriate, the matter will be treated as an incident requiring investigation, and an additional notice will be sent to the XFD ES&H Coordinator.

PRINCIPAL INVESTIGATORS

For the purposes of this plan, the term "Principal Investigator" means any MHATT CAT member, Independent Investigator or other MHATT CAT-authorized individual who is designing, building, or performing an experiment at a MHATT CAT beamline or its

laboratory facilities. Principal Investigators are responsible for working in a safe, orderly, and ecologically sound manner at their beamline and in its associated LOM spaces. Principal Investigators must report hazards associated with their experiments to MHATT CAT management in accordance with the APS Experiment Safety Review procedure. They must also comply with MHATT CAT-issued safety requirements and take the steps needed to ensure that all individuals who could be exposed to hazards as a result of the Principal Investigator's activities have the knowledge, opportunity, and equipment required to control the hazards. Principal Investigators are accountable to the MHATT CAT Sector Manager regarding their safety responsibilities.

VISITORS

The term “visitors” includes scientists, engineers, vendors, students, etc., who have been invited by MHATT CAT personnel to spend time at MHATT CAT facilities but are not Principal Investigators. All visitors who will spend more than five (5) working days at the APS during a calendar year or who will do hands-on work during a shorter visit and possibly become exposed to work-related hazards should consult with the MHATT CAT Sector Manager and the MHATT CAT Safety Coordinator to determine whether they need safety training beyond the standard APS User Orientation.

The MHATT CAT Sector Manager and the MHATT CAT Safety Coordinator will follow the practices set forth in Chapter 17-1 of the *ANL ESH Manual* to determine how to provide for the safety of contractors, service personnel, and vendors. MHATT CAT will also document the hazards associated with the various areas it occupies and provide the information to all who could come into contact with those hazards.

MHATT CAT personnel who escort visitors in MHATT CAT-controlled areas have the following responsibilities:

- Remain with the visitor whenever the visitor is in a controlled area, including every chemical laboratory and radiologically controlled area;
- Ensure that the visitor does not inadvertently trigger an emergency;
- Warn the visitor of hazards in MHATT CAT-controlled spaces and describe required precautions;
- Make sure that the visitor uses all appropriate personal protective equipment and complies with dosimetry requirements;
- Accompany the visitor to “safe ground” during any emergency situation; and
- Ensure that the visitor's emergency medical needs are met as soon as possible.

2.2. HAZARD EVALUATIONS

MHATT CAT will take a graded approach in evaluating the hazards associated with all of the activities to be performed in the spaces it occupies. That is, evaluations will become more comprehensive as the likely severity of a mishap increases or the complexity of the process increases.

INSTALLATION, SUPPORT, AND MAINTENANCE ACTIVITIES

MHATT CAT has identified, at a generic level, the various activities MHATT CAT personnel will routinely undertake during the development and maintenance of MHATT CAT's facilities and while supporting MHATT CAT's research activities at the APS. MHATT CAT has also identified the hazards it believes to be associated with these activities and the hazard control measures that will reduce the associated risks to acceptable levels. Chapter 3 of this plan summarizes this information.

EXPERIMENTAL ACTIVITIES

MHATT CAT has designed its APS facilities to safely accommodate a variety of research and development activities. To supplement this generic level of design, MHATT CAT will obtain sufficient information about the experimental work planned in its sector to determine if its existing facilities and procedures allow the work to be done safely. MHATT CAT will evaluate the hazards associated with the experimental activities and select appropriate controls. If this evaluation indicates that an experiment cannot be performed safely with existing controls, the MHATT CAT Safety Committee will follow the Experiment Safety Review guidance provided by the APS to determine what additional controls are necessary. In some instances, it will be recommended that the work be performed at another beamline specifically designed to handle more serious risks. MHATT CAT will also identify the types of information and training needed by the experimenters to satisfy APS safety requirements and put engineered and procedural controls to best use. If the existing controls appear sufficient, the experiments will be approved contingent on the successful completion of any training the experimenters are required to take. Only after the MHATT CAT Safety Committee has granted approval will an experimenter be authorized to work at the APS.

2.3. ORIENTATION AND TRAINING

MHATT CAT will require its personnel to complete the APS User Orientation provided by the APS and the complementary MHATT CAT-administered Sector Orientation. (See *MHATT CAT Guidelines on the MHATT CAT Sector Orientation*.) MHATT CAT and the APS will jointly establish additional training requirements for individuals as necessary.

IDENTIFYING TRAINING NEEDS

MHATT CAT intends to take full advantage of the capabilities of the APS User Training Management System, administered by the Office of the XFD ES&H Coordinator. MHATT CAT line management may also specify training requirements for MHATT CAT personnel based on other criteria.

EXEMPTIONS TO TRAINING

Exemptions from some required training normally provided by the APS or MHATT CAT may be granted based on an individual's prior education and experience combined, in some cases, with the results of an examination.

TRAINING RECORDS

MHATT CAT will use the APS User Training Management System to keep track of the training given to each individual, whether that training was provided by the APS, MHATT CAT, or another entity.

2.4. COMPLIANCE WITH REGULATIONS

MHATT CAT will comply with all applicable regulations of:

- The Occupational Safety and Health Administration (OSHA),
- The U.S. Environmental Protection Agency (EPA), and
- The U.S. Department of Transportation (DOT).

2.5. APS GUIDANCE DOCUMENTS AND REVIEWS

MHATT CAT will adhere to all APS safety-related specifications for the design of MHATT CAT's facilities and equipment—for example, those found in ANL/APS/TB-14, *APS Beamline Design and Construction Requirements*. The CAT will follow a graded approach in documenting its efforts to characterize hazards and select hazard controls. In accordance with APS design review procedures, MHATT CAT will:

- Make appropriate documents available to the APS,
- Consider all comments offered by the APS, and
- Implement required design changes.

MHATT CAT understands that the APS will continually issue and revise procedures relevant to MHATT CAT's management of environmental, safety, and health concerns. MHATT CAT will incorporate such procedures into its safety program as they become available.

2.6. ORGANIZATIONAL COMMUNICATIONS

NEWSLETTER

The MHATT CAT Newsletter will serve as a primary vehicle for communicating the importance the CAT attaches to safety issues. The newsletter will also be used to report changes in the MHATT CAT's Safety Plan. Typically, the newsletter will contain at least one safety-related article per issue. MHATT CAT will also make an archive of current and past Newsletter articles available via the World Wide Web at <http://www.mhatt.aps.anl.gov/>.

COPIES OF SAFETY PLAN

A written copy of this safety plan will be maintained by the MHATT CAT Sector Manager and will be made available to each MHATT CAT member. MHATT CAT will also make this document available via the World Wide Web. It can be found at <http://www.mhatt.aps.anl.gov/>.

LABORATORY INFORMATION BINDERS

Laboratory Information Binders are located at the entrance to each laboratory and summarize the hazards and controls associated with operations performed in that laboratory. (See *MHATT CAT Guidelines on Laboratory Information Binders*.)

2.7. EMPLOYEE INVOLVEMENT

MHATT CAT encourages responsible input from its members and other users regarding safety concerns that have yet to be effectively addressed. MHATT CAT personnel at every level will be represented on the MHATT CAT Safety Committee. Anyone who feels a safety concern has not been dealt with appropriately should inform the MHATT CAT Director, MHATT CAT Sector Manager, XFD ES&H Coordinator, or XFD Director.

2.8. MANAGING CONFIGURATION CHANGES

Before making any change that could affect the performance of an existing engineered hazard control, MHATT CAT will review and approve the planned change. The purpose of this review is to determine whether additional engineered controls, procedures, training, or information needs to be provided. MHATT CAT will then record the changes and, as appropriate, post warnings to alert personnel who could be affected. Similar requirements apply to changes in the distribution of utilities (electricity, pipes, fluids, and ventilation), the installation of temporary experimental facilities and equipment, and the startup of previously unreviewed systems and activities that could introduce new hazards. MHATT CAT will use the Installation & Maintenance Safety Planner and the Experiment Safety Planners in formulating such changes.

It is MHATT CAT's policy that no shielding or personnel safety system installed by the APS or included in an APS-approved configuration shall be modified, removed, or disabled and that no equipment, system, or apparatus shall be operated outside of its designed safety parameters without a formal review by the applicable XFD safety committees and the written approval of the XFD Associate Division Director for Operations.

2.9. CHEMICAL HYGIENE PLAN

MHATT CAT has developed a Chemical Hygiene Plan (see *MHATT CAT Guidelines for Laboratory Information Binders*) to satisfy APS and OSHA requirements, in accordance with the guidelines established by Chapter 4-2 of the *ANL ESH Manual*. (A copy of Chapter 4-2 is available from the MHATT CAT Sector Manager and is available on the World Wide Web at <http://www.mhatt.aps.anl.gov/>.)

2.10. HAZARD COMMUNICATION PROGRAM

MHATT CAT has woven elements of its hazard communication program throughout this ES&H plan. MHATT CAT believes that these elements address all OSHA and APS requirements.

2.11. PROGRAM EVALUATIONS

SELF-SURVEILLANCE

(See *MHATT CAT Guidelines for Inspections*.)

Informal Observations by MHATT CAT Personnel

All MHATT CAT personnel have the responsibility to notify MHATT CAT line managers of hazardous conditions and observed unsafe actions.

Periodic Inspections

Principal Investigators and Laboratory Safety Captains will inspect all active work areas at least once each week. The MHATT CAT Safety Coordinator will participate in these weekly inspections; findings should be entered into the MHATT CAT Safety Action Item Listing. (See "Records" paragraph below.)

Safety Committee Inspections

The MHATT CAT Safety Committee will conduct quarterly ES&H inspections of all MHATT CAT facilities located at the APS. The MHATT CAT Director may include individuals with special expertise as temporary members of the committee on an as-needed basis.

A report of each safety inspection will be submitted to the MHATT CAT Director. After the Director approves the report, it will be filed with the MHATT CAT Sector Manager, who will send a copy to the XFD ES&H Coordinator.

If during the course of an inspection, the MHATT CAT Safety Committee observes any activity at MHATT CAT's facilities that violates ES&H regulations or acceptable laboratory practices, it may order an immediate suspension of the activity. Notice of the suspension will be immediately communicated to the MHATT CAT Director, and an ES&H Incident Report will be given to the MHATT CAT Sector Manager and XFD ES&H Coordinator. The suspension will remain in effect until compliance is reestablished or a review of the issue by the MHATT CAT Sector Manager confirms that proper guidelines are being met.

Records

MHATT CAT will record all significant findings in a FileMaker Pro database called the MHATT CAT Safety Action Item Listing, which will be maintained by the XFD ES&H Coordinator. The database will be used to track those findings that require corrective actions until all the associated hazards have been abated.

Annual Self-Appraisal

The MHATT CAT Sector Manager will prepare an annual written self-appraisal for the MHATT CAT Director at the end of each calendar year. The report will be written at a summary level and will address the MHATT CAT's performance in each of the major areas covered in this plan—for example, "Accidents and Incidents," "Orientation and Training," etc. In addition, the Sector Manager should report any significant changes that were made to the ES&H plan during the course of the year and recommend actions to address outstanding deficiencies. After review by the MHATT CAT Safety Committee, the report will be forwarded to the MHATT CAT Director, who will direct appropriate changes in MHATT CAT safety procedures.

XFD AND APS OVERSIGHT

MHATT CAT will fully cooperate with the oversight activities of the XFD ES&H Coordinator, other APS safety personnel, and APS User Safety Committees. The CAT understands that APS Floor Coordinators and the XFD ES&H Coordinator will remain

watchful for possible safety problems. MHATT CAT members will deal candidly with these individuals and will make every effort to promptly address their concerns.

2.12. ACCIDENTS AND INCIDENTS

If an unplanned event occurs which has adverse or potentially adverse effects, MHATT CAT will investigate it as described in the *MHATT CAT Guidelines for Accident Investigations*, and will implement the corrective actions needed to ensure that similar accidents or incidents do not occur in the future.

MHATT CAT recognizes that the APS requires prompt notification of some types of incidents. The MHATT CAT Sector Manager will be responsible for this notification.

3. HAZARD EVALUATION AND CONTROL

3.1. CHEMICAL HAZARDS

HAZARD CATEGORIES

The construction, operation, and maintenance of MHATT CAT's facilities and the conduct of experiments there involve the use of numerous substances that pose hazards. Those hazards can occur during or result from:

- Transportation,
- Receiving and distribution,
- Storage,
- Usage (including chemical reactions), and
- Disposal.

The types of hazards posed by the chemicals used at MHATT CAT's facilities include:

- Toxicity,
- Incompatibility (reactivity with other chemicals within MHATT CAT's facilities),
- Strong oxidizing potential,
- Thermal stress,
- Explosivity,
- Corrosivity,
- Flammability, and
- Undesirable environmental impact when not properly controlled.

The chemicals themselves can be categorized as:

- Mineral acids—e.g., nitric acid, sulfuric acid, etc.;
- Organic acids—e.g., acetic acid, etc.;
- Compressed gases—e.g., air, nitrogen, etc.;
- Bases—e.g., sodium hydroxide, etc.;
- Organic solvents—e.g., acetone, methanol, etc.;
- Cryogenic liquids—e.g., liquid nitrogen, etc.

These chemicals will be used for:

- Cleaning parts,

- Providing thermal stability, and
- Preparing samples.

HAZARD CONTROLS

MHATT CAT will control chemical hazards in its facilities by using the facilities and systems described below and in *MHATT CAT Guidelines for the Management of Chemicals*.

APS Chemical Management System

The APS Chemical Management System, which provides a means of inventorying containers of hazardous chemicals, will be used to record the location and ownership of supplies used in operations and maintenance activities, including reagent containers and compressed gas cylinders. It will not be used to inventory experimental samples.

Pre-Purchase Reviews

The MHATT CAT Pre-purchase Review System affords a means of ensuring that required engineered and procedural controls are in place before a new chemical arrives at MHATT CAT's facilities. It also alerts the CAT to arrange for personnel training and required support services.

Experiment Safety Reviews

MHATT CAT Experiment Safety Reviews afford a means of ensuring that required engineered and procedural controls will be in place before a new chemical arrives at MHATT CAT's facilities. It also alerts MHATT CAT to the possibility that a researcher plans to bring in a chemical that is already available on site.

Engineered Controls

MHATT CAT's chemistry laboratory will be equipped with a standard laboratory fume hood, chemical storage cabinets, a drench shower and eyewash, and chemical spill kits appropriate for the chemicals to be handled in the laboratory.

Hazard Communication

Labeling and MSDSs

MHATT CAT will comply with the requirements set forth in the *ANL ESH Manual*.

Hazardous Chemicals List

MHATT CAT will maintain a current list of hazardous chemicals on hand using the capabilities of the APS Chemical Management System.

Samples Brought in by Principal Investigators

It is the policy of the MHATT CAT that users of its facility will be allowed to bring samples to the APS themselves. Such transport of samples will be subject to the following requirements:

- Transport of the samples from the user's home laboratory to the entrance of Argonne National Laboratory and within the laboratory will be performed according to appropriate Department of Transportation regulations. Samples shall be double-contained for transport unless single containment is (a) allowed by DOT and DOE regulations and (b) deemed appropriate, in advance, by the MHATT CAT Sector Manager.
- Transport of the samples within the Argonne facilities will be performed according to appropriate DOE regulations.
- Upon arrival at the MHATT CAT laboratory, each sample will be logged into the MHATT CAT Sample Inventory Database by the MHATT CAT Sector Manager or his designate.
- Any change in the chemical or physical state of the sample will be noted in the Sample Inventory Database as it occurs.
- Upon completion of the experiment the sample will be repackaged and removed from the APS site by the user. Removal will be noted in the Sample Inventory Database by the MHATT CAT Sector Manager or his designate.

Training

General hazard communication topics will be covered in documents provided to all incoming users by the APS and in the orientations conducted by MHATT CAT and the APS User Office. Chemical-specific training for resident MHATT CAT personnel will be provided by MHATT CAT. Such training includes details obtained from the appropriate MSDSs and other sources. Chemical-specific training for nonresident MHATT CAT personnel will be the responsibility of their home institutions.

Chemical Hygiene Plan

The MHATT CAT Chemical Hygiene Plan (see Section 2.9) consists of a set of chemical hazard-control measures appropriate to each laboratory environment. The plan's policies, controls, and procedures are responsive to requirements found in Title 29 CFR 1910.1450, Occupational Exposure to Hazardous Chemicals in Laboratories. The Chemical Hygiene Plan for a specific laboratory is located in the laboratory's Laboratory Information Binder. (See MHATT CAT Guidelines for LOM Laboratory Information Binders.)

Chemical Waste Disposal

The MHATT CAT will dispose of all hazardous chemical wastes generated in the MHATT CAT sector as described in *MHATT CAT Guidelines for Management of Hazardous Waste*.

3.2. ELECTRICAL HAZARDS

HAZARD CATEGORIES

The construction, operation, and maintenance of MHATT CAT's facilities and the conduct of experiments at those facilities involve the use of electrically powered devices. The use and maintenance of these devices pose hazards resulting from:

- Inadequate power distribution,
- Poor equipment design,
- Poor work practices, and
- Inadequate records and configuration control.

HAZARD CONTROLS

Power Distribution

Since the National Electrical Code does not permit the use of extension cords during experimental operations, MHATT CAT has planned for an adequate number of well-placed electrical power outlets along its beamlines and in other areas it controls. MHATT CAT will permit the use of extension cords for short-term temporary applications. Approval by either the MHATT CAT Safety Coordinator or Electrical Safety Coordinator is required prior to any use of extension cords, and only cords provided by these individuals may be used.

Design Criteria

All electrical systems and equipment installed either permanently or temporarily at MHATT CAT's facilities at the APS will meet applicable specifications set forth in the latest edition of the National Electrical Code (NFPA 70), the OSHA electrical safety standards (Title 29 CFR, Part 1910, Subpart S) and the *ANL ESH Manual*, unless the deviations have been reviewed and approved by the APS. MHATT CAT will consider commercially available electrical and electronic equipment approved by nationally recognized testing laboratories as acceptable for use at the APS if the equipment is installed and used as intended by the manufacturer. Commercially available equipment that is modified before installation must meet the specifications, or undergo the APS review, noted above.

MHATT CAT will decide, on a case-by-case basis, whether to allow usage of equipment manufactured in accordance with foreign standards or approved by foreign testing organizations. MHATT CAT advises users to prepare documentation that describes the design of the equipment and any modification

made to adapt it for use at the APS. In questionable situations, MHATT CAT will seek the concurrence of the APS.

Configuration Management

MHATT CAT will maintain drawings and specifications that describe the current configuration of electrically energized equipment and electrical power distribution at its beamlines. Such records will identify the amount of current drawn by each component and the electrical circuit supplying power to each component. The records will also identify equipment that is not grounded. Historical records may or may not be maintained, at MHATT CAT's discretion.

Experiment Safety Reviews and Equipment Inspections

As part of the Experiment Safety Review process, MHATT CAT will review all electrical equipment to be used in experiments in its sector. MHATT CAT will make reasonable efforts to verify that such equipment has been constructed in accordance with the design standards referenced in the "Design Criteria" paragraph above. At a minimum, MHATT CAT will inspect the equipment before it is electrically energized at the APS. The experimenter will be expected to provide, upon request, design documentation that answers questions that cannot be answered by visual inspection. Where appropriate, MHATT CAT may require the experimenter to demonstrate the safety of the equipment through testing. Where appropriate, MHATT CAT will inspect electrical equipment again after installation on the beamline to ensure that installation has not compromised the integrity of either the equipment or any pre-existing beamline safeguards.

Required Work Practices

MHATT CAT and its personnel will:

- Maintain up-to-date drawings and instructions for the operation, maintenance, and testing of electrical equipment and ensure that they are readily available to those who need them;
- Provide appropriate barriers, shields, and warnings if experimental operations preclude grounding the electrical or electronic equipment; and
- Comply with APS requirements for isolating energy sources using lockout and tagout procedures and the requirements for working hot (electrically).

For detailed procedures, see *MHATT CAT Guidelines for Electrical Safety Work Practices*.

Lockout/Tagout Procedures

MHATT CAT supervisors and Principal Investigators will evaluate all planned work to determine whether lockout/tagout procedures are needed to control hazardous electrical energy sources. Where a need exists, the supervisor or Principal Investigator will inform the personnel at risk to use the APS lockout/tagout procedures described in *MHATT CAT Guidelines*

for Electrical Safety Work Practices, which are derived from Chapter 7-1 of the *ANL ESH Manual*.

Working Hot

MHATT CAT supervisors and Principal Investigators will evaluate all planned work to determine whether a need exists to work on or near live components having a potential of 50 volts or greater to ground. Where a need exists, the supervisor or Principal Investigator will inform the personnel at risk to follow the APS Working Hot (Electrically) Procedure described in *MHATT CAT Guidelines for Electrical Safety Work Practices*, which is derived from Chapter 9-1 of the *ANL ESH Manual*. MHATT CAT will develop written procedures covering exempted work, i.e., routinely performed electrical or electronic testing and research and development activities.

Personal Protective Equipment

MHATT CAT will provide appropriate personal protective equipment as described in *MHATT CAT Guidelines for Electrical Safety Work Practices*.

3.3. IONIZING RADIATION

HAZARD CATEGORIES

MHATT CAT activities will expose persons and the environment to the following hazards associated with ionizing radiation:

- Ozone production,
- Prompt synchrotron radiation,
- Prompt radiation from x-ray generators,
- Prompt radiation from sealed radioactive sources,
- Contamination (leakage from sealed sources),

HAZARD CONTROLS

Ozone Abatement

MHATT CAT will abate the production of ozone, so far as is practical, by discouraging the use of experimental setups that require an x-ray beam to pass through air. Evacuated or He flight paths will be used to minimize ozone production. Where the beam must pass through air, MHATT CAT will assess and control ozone exposures by following the guidance provided by the APS. MHATT CAT will limit ozone exposures by using local or general exhaust systems in experimental stations where ozone is generated. At the time of this writing, any system that exhausts the air into an occupied space requires APS approval. (Note: The APS is seeking ozone removal solutions that would mitigate this requirement.)

Training

MHATT CAT personnel will comply with the training requirements set forth in the U.S. Department of Energy's *Radiological Control Manual*. MHATT CAT will rely on the APS User Training Management System to determine the level of training an individual requires. MHATT CAT personnel who have received equivalent "core" training at other U.S. Department of Energy facilities will still receive the APS-specific portions of the APS-administered radiological safety training. MHATT CAT personnel will also comply with the radiological safety training requirements set forth in Chapter 5-14 of the *ANL ESH Manual*.

Shielding and the APS Personnel Safety System (PSS)

MHATT CAT will comply with the shielding specifications issued by the APS and will verify the effectiveness of the shielding by using survey meters. Where calculations or a survey indicates the need for additional shielding, supplementary shielding will be installed and managed in accordance with APS guidelines.

It is the policy of MHATT CAT that no shielding or personnel safety system installed by the APS or included in an APS-approved configuration shall be modified, removed, or disabled and that no equipment, system, or apparatus shall be operated outside of its designed safety parameters without a formal review by the applicable XFD safety committees and the written approval of the XFD Associate Division Director for Operations.

Time and Distance

In keeping with the ALARA principle, MHATT CAT will encourage those working in the APS experiment hall to keep their exposures to a minimum by remaining in radiologically controlled areas only as long as absolutely necessary.

Dosimetry

MHATT CAT personnel will participate in the radiological dosimetry program managed by the ANL ESH Division and will follow the procedures issued by the APS.

Monitoring Instruments

MHATT CAT will purchase radiological survey instruments only after APS review and approval. MHATT CAT will attempt to ensure the continued reliability of those instruments, in part, by participating in the calibration and maintenance program administered by ANL ESH-Health Physics personnel.

Radioactive Source Control and X-ray Generator Usage

MHATT CAT will participate in the APS Sealed Source Inventory Program by following relevant procedures issued by the APS. MHATT CAT will also take steps to ensure that persons planning to move radioactive materials to the APS are aware of relevant U.S. Department of Transportation requirements.

MHATT CAT will implement an x-ray laboratory safety program that follows the guidance provided by the APS.

The Laboratory Safety Captain assigned to a laboratory that uses sealed radioactive sources will ensure that ANL and APS requirements for inventorying, storage, and use are met. (See *MHATT CAT Guidelines for the Management of Sealed Radioactive Calibration Sources*.)

ANL and APS Support Programs

MHATT CAT will make full use of APS and ANL programs that contribute to the control of radiological hazards. These programs include:

- U.S. Department of Energy-accredited personal dosimetry,
- Survey instrument calibration and maintenance,
- Radiological training,
- Transportation safety, and
- The Sealed Source Inventory Database.

3.4. INSTALLATION AND MAINTENANCE ACTIVITIES

The MHATT CAT hazard evaluation and control effort with respect to installation and maintenance activities is based on the following concepts:

- MHATT CAT line management is responsible for planning and implementing the hazard controls required to ensure safe construction, modification, and maintenance of the MHATT CAT beamlines and support facilities;
- When necessary, line management will involve in the planning effort those MHATT CAT members and nonmember support personnel who are best qualified to anticipate the hazards that will be present during the installation and maintenance activities.
- Because preliminary hazard evaluation efforts have indicated that installation and maintenance activities will pose a relatively small number of hazards, a programmed database will be used to help identify hazards and select controls.
- Additional hazard controls will be implemented, and hazard evaluation and control documentation will be promptly revised, to address unanticipated hazards encountered during the installation activities.

Outside contractors must assess the hazards associated with their work and submit a document to the contract manager that identifies the hazards and planned controls. (See Chapter 17-1 in the *ANL ESH Manual* and the *ANL Manual of Construction*.) MHATT CAT will generally accept as sufficient any plans developed by contractors that have been reviewed and approved by the ANL ESH Division.

HAZARD CATEGORIES

MHATT CAT has identified the following installation, modification, and maintenance activities as major sources of hazards:

- Hand and portable-power tool usage;
- Hoisting and rigging and other material handling;
- Work from elevated surfaces;
- Work posing pressure-related hazards;
- Work with hazardous materials, including cryogenic liquids and compressed gases;
- Hot work (fire hazards);
- Work on or near electrically energized components; and
- Exposure to ionizing radiation.

HAZARD CONTROLS

The person who is planning an activity identifies hazards and hazard controls as outlined in the MHATT-CAT ES&H Plan in order to constitute a safety plan for the activity.

The MHATT CAT Safety Coordinator reviews all such plans and either concurs with the hazard identifications and controls or attempts to reconcile disagreements. The final plans are then sent to the appropriate first-line supervisors and/or Principal Investigators, who ensure that all controls are in place before work begins.

MHATT CAT management expects that supervisors will inform those performing each activity of all hazards and required controls during technical meetings or as on-the-job training. In addition, any CAT member may request access to those safety plans pertaining to activities in which he or she is engaged or by which he or she is otherwise affected.

The MHATT CAT Sector Manager will maintain an up-to-date version of each safety plan and will provide a complete set of the plans and updates to the MHATT CAT Safety Coordinator and the XFD ES&H Coordinator, as necessary.

Key Personnel

The MHATT CAT Sector Manager has the primary responsibility for collecting the information needed to characterize hazards and select controls. However, the Manager may delegate this responsibility to other personnel who have the expertise to effectively carry out the planning effort.

As stated above, the MHATT CAT Safety Coordinator will review all safety plans and strive to resolve any disagreements with the planners. If the MHATT CAT Safety Coordinator is unavailable or is directly involved in a disagreement, the MHATT CAT Sector Manager should resolve the disagreement with assistance of an ES&H professional, if needed.

Training

MHATT CAT will manage training needs required for installation or maintenance activities either by arranging for the training through the APS or by conducting the training itself.

Required Certifications

Some tasks, such as waste certification and some hoisting and rigging operations, may be performed at the APS only by an individual having ANL certification for the task. MHATT CAT will comply with APS-issued guidance for such activities. (See *MHATT CAT Guidelines for Hoisting and Rigging Operations* and *MHATT CAT Guidelines for the Management of Hazardous Waste*.)

Hand Tool and Portable Power Tool Usage

MHATT CAT recognizes that the misuse of hand tools and portable power tools is a source of injury even for experienced workers. For this reason, MHATT CAT will require training of all members who are likely to routinely use such tools at the APS. (See *MHATT CAT Guidelines for Hand Tool and Portable Power Tool Usage*.)

Activities Requiring Safe Work Permits

As appropriate, MHATT CAT personnel will obtain the following safe work permits before undertaking the corresponding activity:

Working Hot (Electrically)

This type of permit is required prior to work involving potentially injurious electrical circuits. MHATT CAT will also follow relevant guidance provided by the APS. Chapter 5-4 of the *ANL ESH Manual* provides more detailed information, including a description of exempted activities. Also see *MHATT CAT Guidelines for Electrical Safety Work Practices*.

Open Flame and Spark-Producing Operations

This type of permit is required prior to any open flame or spark-producing activities. Chapter 11-4 of the *ANL ESH Manual* provides more detailed information.

Fire Protection System Impairment

This type of permit is required prior to any planned impairment of the fire protection system or any component thereof. Chapter 11-5 of the *ANL ESH Manual* describes the mechanism for obtaining a permit.

Radiation Work

This type of permit is required prior to any radiation work satisfying one or both of the following criteria:

The job is not frequently done or has never been done before.

The radiological conditions are unknown and are likely to pose a significant hazard.

Chapter 5-4 of the *ANL ESH Manual* provides more detailed information.

Safety Equipment

Material Handling Equipment

MHATT CAT members will use material handling devices to aid in the movement and positioning of heavy or awkward equipment and materials. The MHATT CAT Safety Coordinator will review requisitions for such equipment to ensure that the requisition specifies compliance with relevant ASME B-30 Series standards. (See *MHATT CAT Guidelines for Hoisting and Rigging Operations*.)

Fall Protection

The MHATT CAT Safety Coordinator must approve every fall-protection device used at the APS. As a rule, new purchases of such devices require the Sector Manager's signature, and previously purchased items require inspection prior to their initial use at the APS. Devices must satisfy the requirements in Chapter 12-1 of the *ANL ESH Manual*. MHATT CAT will ensure that persons receive training before they use fall-protection devices.

Work Area Demarcation, Warnings, and Controls

The supervisor of each installation or maintenance activity will ensure that the boundaries of the work area are marked whenever appropriate and that adequate warnings are in place. (See *MHATT CAT Guidelines for Work Area Demarcation, Warnings, and Controls*.)

3.5. COMMISSIONING ACTIVITIES

MHATT CAT will comply with all APS policies and procedures related to the preparation for and verification of beamline commissioning readiness. MHATT CAT has reviewed the APS document covering commissioning readiness (*Advanced Photon Source Experimental Beamline Commissioning Readiness Process*) and understands its own role in planning some commissioning activities. MHATT CAT believes that it will be able to effectively control anticipated commissioning hazards using the processes set forth in the APS document. If MHATT CAT becomes aware of any hazard not covered by the APS plans, it will immediately inform the XFD Associate Director for Operations and the XFD ES&H Coordinator.

3.6. EXPERIMENT SAFETY

Most hazards associated with the preparation and conduct of MHATT CAT experiments at the APS have been addressed under the specific hazard categories listed above. MHATT CAT will follow the experiment safety review guidance issued by the APS to ensure that sufficient controls are in place before experimental work begins.

3.7. USER LOM SHOP OPERATIONS

HAZARD CATEGORIES

Common machine shop hazards can result in eye injuries, cuts, amputations, contusions, fractures, and other injuries; respiratory problems; and skin disease.

HAZARD CONTROLS

MHATT CAT will reduce risks through usage of the following controls:

Personal Protective Equipment (PPE)

MHATT CAT expects all personnel and visitors to wear safety glasses with side shields at all times while in the User LOM Shop. In addition, MHATT CAT expects machine shop users to comply with all other posted PPE requirements while working with machinery.

Training and Authorization

A person may use the User LOM Shop after demonstrating the appropriate skills and obtaining authorization from the User LOM Shop Coordinator or alternate. When necessary, some level of orientation will be provided to those requiring use of a machine.

Equipment Purchase Reviews

New machines for the User LOM Shop will not be ordered without review and approval of the requisition by the User LOM Shop Coordinator and the APS. The MHATT CAT Shop Safety Coordinator will ensure that required power transmission and point-of-operation guarding is specified in the order.

Guarding

MHATT CAT personnel will be instructed not to modify or circumvent machine guarding, including point-of-operation guarding, on any machine in the User LOM Shop, including machines owned by MHATT CAT. MHATT CAT personnel will report troublesome guards to the User LOM Shop Coordinator, APS Floor Coordinator, or MHATT CAT Shop Safety Coordinator. MHATT CAT will consult with the APS Floor Coordinator when attempting to resolve the problem.

Postings

Machine-specific requirements for User LOM Shop equipment will be listed on a nearby posting. MHATT CAT personnel are expected to satisfy all such requirements. The posting will also list the names of those authorized to use each machine and contact information for individuals who wish to gain authorization to use a machine.

3.8. OFFICE SAFETY

HAZARD CATEGORIES

The most significant hazards present in MHATT CAT's office spaces are:

- Ergonomic stresses,
- Housekeeping,
- Electrical safety hazards, and
- Fire hazards.

HAZARD CONTROLS

Repetitive-Stress Awareness

MHATT CAT will informally provide its personnel with information about the potential problems associated with the use of computer keyboards and the measures that can be taken to reduce the risk of repetitive-stress injuries.

Housekeeping

MHATT CAT will advise all personnel of the need to maintain an orderly office environment with clear paths of egress.

Electrical Safety Guidance

MHATT CAT will plan the distribution of electrical power in its office spaces to minimize the need for extension cords. If an extension cord must be used, it will be selected and located in accordance with the *MHATT CAT Guidance for Electrical Safety Work Practices*.

Fire Hazard Safeguards

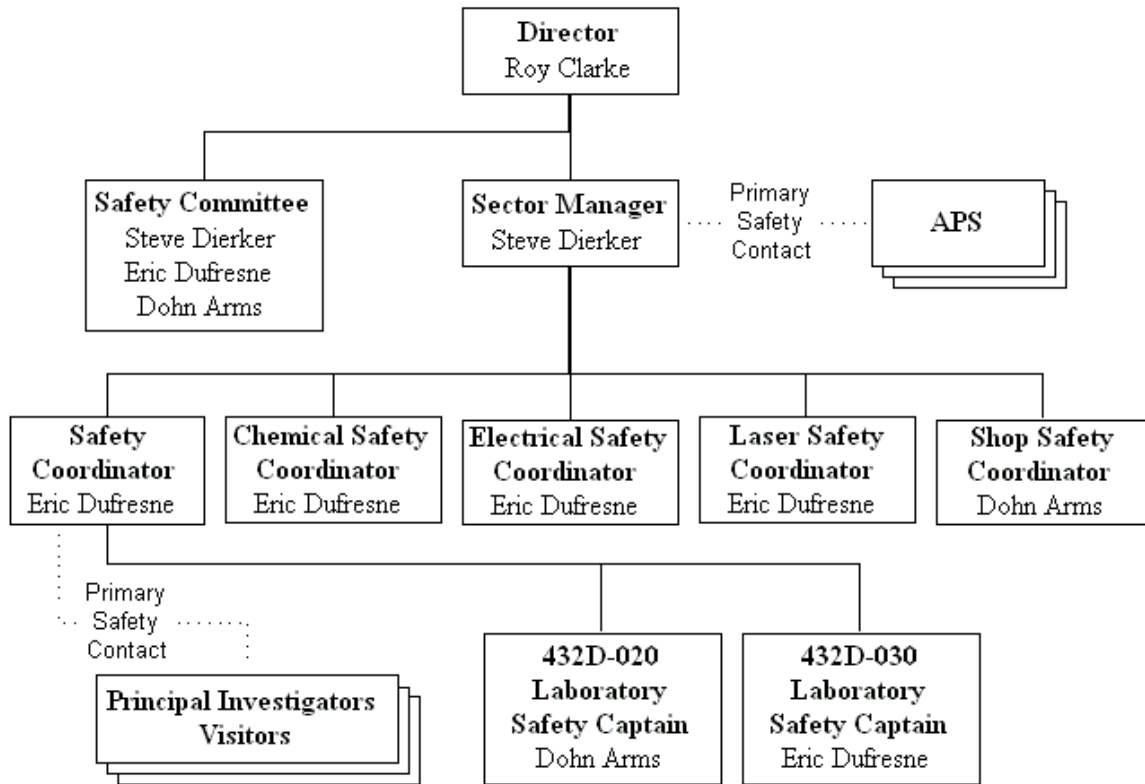
MHATT CAT will ensure that heat-producing appliances are kept away from combustible materials. It will also screen requisitions for heat-producing equipment that might be used in offices, to ensure that the equipment incorporates appropriate safeguards.

4. SAFETY GUIDANCE, PRACTICES, & PROCEDURES

4.1. LISTING OF ASSIGNMENTS FOR KEY MHATT CAT SAFETY PERSONNEL

Safety Function Title	Name	Phone No.	Pager	E-mail Address
Director	Roy Clarke	(734)-764-4466		royc@umich.edu
Sector Manager	Steve Dierker	(734)-764-5276		dierker@umich.edu
Safety Coordinator	Eric Dufresne	(630)-252-0274	4-0274 or by email at: 0274@page.anl.gov	dufresne@umich.edu
Chemical Safety Coordinator	Eric Dufresne	(630)-252-0274	See above	dufresne@umich.edu
Electrical Safety Coordinator	Eric Dufresne	(630)-252-0274	See above	dufresne@umich.edu
Laser Safety Coordinator	Eric Dufresne	(630)-252-0274	See above	dufresne@umich.edu
Shop Safety Coordinator	Dohn Arms	(630)-252-0272		dohnarms@umich.edu
Laboratory Safety Captains				
432-D020	Dohn Arms	(630)-252-0272		
432-D030	Eric Dufresne	(630)-252-0274		
Safety Committee Members	Steve Dierker	(630)-252-0277		
	Eric Dufresne	(630)-252-0274		
	Dohn Arms	(630)-252-0272		

ORGANIZATION CHART FOR KEY MHATT CAT SAFETY PERSONNEL



4.2 MHATT CAT GUIDELINE FOR HAND TOOL AND PORTABLE POWER TOOL USAGE

INTRODUCTION

MHATT CAT recognizes that the misuse and improper maintenance of hand tools and portable power tools cause a significant number of injuries to even “experienced” workers. Consequently, MHATT CAT has adopted the following policies and procedures to minimize the hazards associated with the use of such equipment at the APS.

These guidelines apply to all use of hand tools and portable power tools by MHATT CAT personnel while performing maintenance or installation activities at the APS. Although MHATT CAT feels that most of the guidelines also apply to tool usage during experimental activities, MHATT CAT will not require that short-term users complete the training described below.

USING TOOLS SAFELY

- If you have not had formal training in the use of common tools, either view the video *Hand Power Tool Safety*, which is available from the Office of the XFD ES&H Coordinator, or attend ANL ESH Course #141. MHATT CAT supervisors or other capable persons designated by supervisors will also demonstrate correct tool usage during on-the-job training. *[APS can provide additional information adaptable to most training needs for air-powered tools.]*
- Plan each job well in advance and ensure that the proper tools are available; give consideration to special tools that would provide for greater efficiency and safety.
- Use proper personal protective equipment.
- Store tools in appropriate storage facilities when not in use.
- Inspect all portable power tools upon receipt and at least semi-annually thereafter using the criteria given in Table 1. If a tool is defective, remove it from service immediately and repair or discard it. If it passes the inspection and tests, label it with the inspection date *[as indicated in Table 2] [with commercially available foil labels designed for this purpose]*.
- Never use a tool that has an out-of-date inspection code without first inspecting it as indicated in Table 1.
- Power tools must be either three-wire grounded or double-insulated and listed by Underwriters’ Laboratories or another recognized listing agency.
- Always plug cord-connected, hand-held electric tools into GFCI-protected receptacles.

- Portable electric tools used in the vicinity of sinks and wet environments must comply with the grounding requirements of Title 29 CFR Part 1910, Subpart S, and they must be powered from a GFCI-protected circuit.

TABLE 1. Power Tool Inspection/Testing Criteria and Inspection Frequency

	Inspection Frequency	
	Before and During Use	Semi-Annual Testing and Inspection
Criteria for Removing a Tool from Service		
Cracking, chafing, wear, or other signs of faulty power cord insulation	X	X
Evidence of faulty grounding conductor	X	X
Excessive resistance between tool case and ground connector prong		X
Cracked plug or receptacle housing	X	X
Bent or missing plug or connector prongs	X	X
Dead front plug, receptacle, or connector	X	X
Missing, bent, or otherwise abused switch	X	X
Improperly functioning trigger lock on switch	X	X
Out-of-date semi-annual inspection tape (tag)	X	X
Signs of overheating or excessive sparking	X	X
Insulation resistance (get meter from XFD ES&H Coordinator)		X
Dull, chipped, or broken blades	X	X
Malfunctioning guards	X	X

TABLE 2. Color Code Schedule for Portable Power Tools, Indicating Date of Most Recent Inspection and Test

Months	Year	Tape Color
January through June	1999	Black
July through December	1999	Blue
January through June	2000	Red
July through December	2000	Green
January through June	2001	Orange
July through December	2001	White

REFERENCES

- The primary references for this set of guidelines are the 10th Edition of the National Safety Council's *Accident Prevention Manual* and the *ANL ESH Manual*.

4.3 MHATT CAT GUIDELINE FOR PERSONAL PROTECTIVE EQUIPMENT

INTRODUCTION

MHATT CAT recognizes that improper selection or misuse of personal protective equipment (PPE) can have severe consequences. Consequently, the CAT has adopted the following policies and procedures to ensure the proper selection and use of such equipment by MHATT CAT personnel working at the APS.

ROLES & RESPONSIBILITIES

- The MHATT CAT Safety Coordinator or designee shall review and approve PPE as indicated below.
- Supervisors and Principal Investigators shall plan each job well in advance, giving adequate consideration to selecting PPE that would provide for greater safety and efficiency. The MHATT CAT Safety Coordinator will then review the selection(s).
- Supervisors, Principal Investigators, and Laboratory Safety Captains shall ensure that appropriate PPE is available when needed.
- Supervisors, Principal Investigators, and Laboratory Safety Captains shall not assume that MHATT CAT personnel initially know how to select or safely use PPE. Instead, they shall provide for all necessary instruction and guidance.
- Supervisors and Principal Investigators shall enforce the use of proper PPE.
- Supervisors and Principal Investigators shall routinely observe MHATT CAT personnel's use of PPE to ensure that the equipment is being used correctly. They shall also periodically look for signs of abuse or misuse.
- Supervisors, Principal Investigators, and Laboratory Safety Captains shall establish a means of periodically verifying that reusable PPE remains in good condition and that defective PPE is immediately removed from service.
- Supervisors and Principal Investigators shall ensure that required storage facilities are available where needed and that members properly store PPE that is not in use.
- Members shall be instructed to restrict their use of PPE to what has been approved for the member's intended application.
- As appropriate, members shall inspect PPE and refrain from using equipment that fails to pass the inspection.

PPE APPROVALS

Because the limitations of various types of PPE are not commonly understood, all personal protective equipment must be approved for its intended use by the MHATT

CAT Safety Coordinator or designee. Moreover, the MHATT CAT Safety Coordinator's review and approval is required for any purchase of personal protective equipment, unless the PPE is being purchased to replace depleted stock and the replacement is intended for a previously reviewed and approved use. In the event the MHATT CAT Safety Coordinator is unavailable, a knowledgeable supervisor may approve the use of PPE after consultation with the XFD ES&H Coordinator or ANL ESH Division.

GUIDANCE ON COMMON TYPES OF PERSONAL PROTECTIVE EQUIPMENT

Safety Eyewear

MHATT CAT personnel will wear appropriate protective eyewear that meets the requirements of the ANSI Standard Z87.1 whenever they are in areas, or performing activities, that pose a danger of eye injury.

Plano (noncorrective) safety glasses, face shields, and chemical splash goggles can be obtained from the APS stockroom. All MHATT CAT personnel should specify safety glasses that have side shields. Contact the MHATT CAT Safety Coordinator for guidance on obtaining prescription safety glasses.

Personnel who already have safety glasses should seek verification from the MHATT CAT Safety Coordinator or XFD ES&H Coordinator that their eyewear satisfies all requirements.

Safety Footwear

In posted areas and when activities present a moderate or greater risk of foot injury, MHATT CAT personnel should wear safety footwear that meets the requirements of ANSI Standard Z41.

Head Protection

MHATT CAT members working with high-voltage equipment, in construction areas, or in other areas where there is a danger of head injury from falling or propelled objects must wear hard hats (safety helmets) that satisfy the requirements of the ANSI Z89.1 or Z89.2 standards. Hard hats are available from the APS stockroom.

Hearing Protection

MHATT CAT members who wish to use hearing protection equipment should consult with the XFD ES&H Coordinator. The equipment is available from the APS stockroom.

REFERENCE

The primary reference for this set of guidelines is Chapter 12-1 of the *ANL ESH Manual*.

4.4 MHATT CAT GUIDELINE FOR WORK AREA DEMARCATION, WARNINGS, AND CONTROLS

INTRODUCTION

By means of the practices described below, MHATT CAT hopes to reduce risks resulting from persons inadvertently entering a hazardous work area.

CREATING AN EXCLUSION ZONE

When performing work that could put others at risk, you must demarcate an exclusion zone around your work. This is typically done with yellow and black plastic “barricade tape.” Use signs, placards, and other postings as necessary to warn others not to enter the demarcated area unless they have business in the area and have authorization (blanket or occasion-specific) to enter. Where appropriate, post special requirements for entry.

ENTERING AN EXCLUSION ZONE

Do not enter unless you meet all of the following conditions:

- You have business in the area;
- You have authorization to enter; and
- You are in compliance with all posted requirements for entry.

WARNING SIGNS

Caution—Eye Protection Required signs shall be posted at the entry to all areas where the potential for eye injury exists, such as laboratories, shops, and beamline radiation enclosures.

Caution—Hard Hat Required signs shall be posted at the entry to all areas where the potential for head injury exists, such as where installation work is being performed overhead or where persons might bump their heads on low-hanging objects.

Caution—Foot Protection Required signs shall be posted at the entry to all areas where there is a moderate-or-greater likelihood of suffering a foot injury caused by a falling or rolling object.

A **HOT** sign shall be posted during bakeouts of vacuum equipment and while hot plates and heating mantles are in use.

These hazard and warning signs and others are available through the MHATT CAT Sector Manager or MHATT CAT Safety Coordinator.

4.5 MHATT CAT GUIDELINE FOR ELECTRICAL SAFETY WORK PRACTICES

PURPOSE

This document provides basic safety guidance for beamline personnel who are constructing, installing, testing, repairing, or modifying electrical equipment in APS laboratories and on the experiment hall floor. This guidance has been adopted from the documents listed under REFERENCES. These references should be consulted for situations that are not covered in this document and when a more detailed examination of the regulations is needed to ensure full compliance. The MHATT CAT Electrical Safety Coordinator shall be considered as the authority for interpreting the applicable codes and regulations.

GENERAL WORK PRACTICES

Introduction

Both MHATT CAT and the APS strongly emphasize electrical safety awareness. Low-level alternating current can be extremely dangerous if the path of the current is through the heart. This can cause ventricular fibrillation, which may quickly lead to death. Cardiopulmonary resuscitation (CPR) can save some victims if applied immediately. CPR training is available from the ANL Fire Department; biennial recertification is required.

Precautions

- Always use safety glasses with plastic frames as the minimum eye protection when fabricating or maintaining electrical equipment.
- Always remove metallic personal articles (e.g., watches, rings, earrings, necklaces, key chains, or wristbands) before working on electrical or electronic equipment.
- Never enter a hazard area alone.
- Never use metal ladders or metal measuring tape where they may come in contact with electrical equipment. Use ladders with fiberglass side rails instead.
- Report abandoned electrical cables and equipment to your MHATT CAT Electrical Safety Coordinator.
- Be alert for stray currents following paths caused by leakage (surface contamination), corona, or the ionizing effect of a flame.
- When working in any area of high hazard (i.e., high-voltage power supplies, dischargeable capacitors, step-down transformers, complexes of electrical cabling, etc.), always have at least one

person present who is trained in emergency-response procedures and has up-to-date certification in CPR.

- Most importantly, if you observe a potential hazard, report it immediately to your CAT Safety or Electrical Safety Coordinator or APS Floor Coordinator.

The MHATT CAT and ANL restrict work on equipment that remains connected to energy sources if workers could contact energized components with a potential of 50 volts or greater to ground. If such work is necessary, strictly follow ANL “working hot” procedures (below). Contact your MHATT CAT Electrical Safety Coordinator for further information or consult Chapter 9-1 of the *ANL ESH Manual*.

Safe Cord and Cable Usage

Never use single-to-multiple outlet converters (“cube taps”). Instead, use power distribution strips with integral power cords, built-in circuit breakers, and built-in surge protection. These are available through the Argonne Materials Ordering System (AMOS).

Equipment that is not double-insulated must have a three-prong, grounded plug. Plug tools equipped with a three-prong plug into a three-hole electrical receptacle. If you use an adapter to accommodate a two-prong receptacle, the adapter must be attached to a known ground. Never use any equipment containing a three-prong plug with the ground pin removed.

Use only MHATT CAT-issued extension cords. Never run them through walls, windows, or doorways or behind walls, ceilings, or floors, and do not connect extension cords in series.

Flexible cords create a tripping hazard when laid across floors. Use cable trays or similar devices to suspend the cords over the work area if possible. Where this is not feasible, mark the area as a work area with appropriate signs and barricades and use cord ducts or place protective runways over the cords.

Properly identify electrical cables at least at all points of termination or splicing, to facilitate their eventual removal. Also, use cable tables and interwiring diagrams to document any electrical wiring that you install. Immediately remove all cables that are no longer in use and update the tables and diagrams accordingly.

Portable Electrical Tools

See MHATT CAT Guidelines for Hand Tool and Portable Power Tool Usage.

DE-ENERGIZING ELECTRICAL EQUIPMENT

De-energize electrical equipment before working on it, except as noted below. Before working on electrical equipment, notify the MHATT CAT Electrical Safety Coordinator and, as appropriate, MHATT CAT management that the equipment requires servicing. Upon receiving authorization, de-energize the system using the procedures described below.

Plug-and-Cord Connected Equipment

Many types of electrical equipment may be de-energized by simply unplugging the power cord and maintaining control over the plug. Nevertheless, before beginning work, verify that the equipment has not stored electrical energy. In some equipment, circuits having the potential for storing electrical energy are marked at the points where a grounding stick is to be applied. If this is not the case, check the circuits with an appropriate test instrument (e.g., a voltmeter) to locate sources of stored electrical energy. Drain stored energy with a grounding stick and use the test instrument to verify that the energy has been discharged. Keep the grounding stick connected to the main discharge point while working on the equipment.

Hard-Wired Equipment: Lockout/Tagout Procedures

For electrical equipment that is hard-wired to breaker or disconnect boxes, use the following lockout/tagout procedure to de-energize the circuit and ensure that it will not be inadvertently reactivated during work. Never attempt to start, energize, or use equipment that is locked out of service, and never attempt to defeat a lock or remove a tag without authorization. The ANL-required lockout/tagout procedures are described below; for more information, refer to Chapter 7-1 of the ANL ESH Manual or consult the Electrical Safety Coordinator.

To lock out and tag out electrical equipment:

1. Identify all energy sources and control switches or other energy isolating devices that control the supply of energy to the equipment to be locked out.
2. Notify your CAT Electrical Safety Coordinator, supervisor, and affected personnel about the lockout. This notification can be verbal.
3. If the equipment is operating, notify the person responsible for the equipment that the equipment is to be shut down and verify that the controls have been left in the “OFF” position.
4. Disengage all energy sources, and verify with an appropriate test instrument that power has been turned off.
5. Place a lock on the energy isolating device that controls the energy source (each person working on the equipment must apply a separate lock). Use only approved locks obtained from the lockout/tagout stations throughout the APS site. Register each lock and tag removed from the station in the station logbook and fill out the information required by the lockout tag. Each worker then keeps the key to his or her lock until that lock is removed.
6. Dissipate all stored energy where possible, and use an appropriate instrument to verify that the energy has been dissipated. (See Section on Plug-and-Cord Connected Equipment.)
7. Prior to starting work on equipment that has been locked out, all workers should verify collectively that the equipment is isolated and de-energized.

(A grounding stick should be kept in place while work continues, as described above.)

8. If work carries over to the next shift, notify all members of the next shift that the equipment is still under lockout and remove all locks; the members of the next shift must then apply their own locks and tags.
9. When work is completed, remove the grounding stick and all locks and tags.

PERFORMING WORK ON ELECTRICALLY ENERGIZED CIRCUITS ("WORKING HOT")

Developmental Work or Testing

Routine electronic and electrical work of a developmental or testing nature may be done while the electrical circuits involved are energized, without a hot work permit or an assigned Safety Watch. However, the work must be performed in accordance with the definitive written procedures and MHATT CAT rules of electrical safety listed below under "Protective Measures."

Other Work on Electrically Energized Circuits

Other than those tasks covered by the section above, work on or near electrically energized components having a potential of 50 volts or greater above ground may be done only after obtaining a Hot Work Permit (Electrical) and designating a Safety Watch. The Electrical Safety Coordinator will specify additional requirements for working hot and will define the applicability of blanket permits. Persons who anticipate a need to work hot while at the APS should discuss their planned activities with the CAT Electrical Safety Coordinator well in advance.

Working hot shall be conducted in accordance with the procedures contained in Chapter 9-1 of the *ANL ESH Manual*. These procedures are summarized below:

1. A Hot Work Permit (Electrical) must be processed and approved prior to the start of work.
2. Appoint one person as the Safety Watch. A Safety Watch is responsible for ensuring that all protective devices and procedures are used and that all safety requirements are met. The Safety Watch must have:
 - CPR certification,
 - immediate access to a telephone or radio to call 911 in case of an emergency, and
 - the capability to immediately cut off all power sources.
3. Obtain proper training and a thorough knowledge of the circuitry involved from a study of the physical system or an up-to-date schematic drawing. Locate and note all de-energizing points and energizing sources.
4. Use proper protective equipment and only those power sources having adequate fault protection.
5. Write safe procedures for other than routine tasks.

Protective Measures

1. Insulate yourself from contact with ground potential and energized parts by using insulated tools; linemen's gloves, mats, and sleeves (all inspected and tested); phenolic sheets; dry boards; rubber-soled shoes (no nails); and/or insulative mechanical barriers. Do not depend on the insulation on energized wires for protection; it may have cracks or other defects. All tools used for electrical work must be insulated sufficiently to protect the worker during normal use of the tool. Linemen's gloves must be tested and rated for more than the voltage of the energized parts. Insulative barriers should prevent anyone from falling or leaning into live parts and should also prevent any live parts such as a wire, cable, or bus bar from falling onto people or grounded metal.
2. Avoid water and dampness.
3. Ground all noncurrent-carrying parts that may become accidentally energized by a shorting tool or other object in order to prevent shocks to grounded persons.
4. To protect yourself against the splatter of accidental arcing, wear plastic-framed safety glasses, long sleeves, a buttoned shirt, and a hard hat.
5. The Safety Watch must be ready to instantly de-energize all power.
6. Demarcate the work area to keep nonparticipants from entering.

REFERENCES

- National Electrical Code 1993 (NFPA 70).
- NEC Handbook 1993.
- Title 29 Code of Federal Regulations (CFR) Part 1910, Subpart S.
- Electrical Surveillance Guide (DOE, Oak Ridge Field Office).
- DOE Electrical Safety Guideline 1993.
- ANL ES&H Manual.

4.6 MHATT CAT GUIDELINE FOR THE MANAGEMENT OF CHEMICALS

INTRODUCTION

This guideline describes the policies and practices that MHATT CAT will follow to reduce accidents and control adverse effects that may result from the use of hazardous substances in MHATT CAT's facilities at the APS. This guideline applies to all chemicals used for MHATT CAT's installation and maintenance activities and to all chemical reagents used for laboratory purposes. Experimental samples are included only to the extent specified below.

While this guideline does provide policies and general guidance, it may not include all precautions that are needed for the safe conduct of certain operations. MHATT CAT has developed other guidelines that define how hazard controls for individual operations will be determined and implemented. In general, the supervisor or Principal Investigator is responsible for obtaining the information and implementing the controls necessary for workers to perform work without endangering themselves, others, or the environment. MHATT CAT welcomes suggestions for alternatives to the proposed controls.

ROLES & RESPONSIBILITIES

Users of Chemicals will:

- Become familiar with the hazards associated with the chemicals before using them, and
- Become familiar with the hazard controls for the intended application of the chemicals and verify the proper functioning of such controls before chemical usage begins.

Supervisory Personnel (Including Principal Investigators) will:

- Provide the MHATT CAT Safety Coordinator or Chemical Safety Coordinator with timely advanced notice of the need to use chemicals;
- Give the MHATT CAT Safety Coordinator appropriate safety information for each chemical;
- Become familiar with the hazards associated with the chemicals and ensure that the information is communicated to the persons working with the chemicals; and
- Become familiar with appropriate hazard controls and ensure that required controls are in place before workers begin using the chemicals.

Laboratory Safety Captains will:

- Maintain an awareness of the chemical-related activities conducted in the spaces under their control;
- Periodically verify the proper functioning of the engineered controls and the proper maintenance of storage facilities; and
- Periodically verify the proper labeling of chemicals stored in their facilities.

The Safety Coordinator and Chemical Safety Coordinator will:

- Review the proposed introduction of new chemicals into MHATT CAT's facilities to verify that sufficient controls are (or will be) in place to ensure that the chemicals can be used safely, and
- Review proposed new uses of chemicals that are currently in stock, to verify that sufficient controls are (or will be) in place to ensure that the chemicals can be used safely.

CONTROLS ON THE INTRODUCTION AND USAGE OF CHEMICALS**Pre-Purchase and Pre-Usage Reviews**

MHATT CAT personnel wishing to bring new chemicals into the MHATT CAT facilities at the APS must obtain approval from the MHATT CAT Safety Coordinator or MHATT CAT Chemical Safety Coordinator. Obtaining approval requires, at a minimum, submitting Material Safety Data Sheets for the chemicals. MHATT CAT will also rely on information gleaned from the Installation & Maintenance Safety Planner and its Experiment Safety Review procedure to alert it to the planned use of hazardous chemicals.

Review Criteria

MHATT CAT personnel reviewing the proposed new usage of a chemical in the MHATT CAT facilities will consider the following issues:

- Availability of suitable storage facilities;
- Adequacy of existing engineered controls;
- Adequacy of existing procedures;
- Waste handling capability and needs;
- User training.

Approval will not be given until the reviewer is satisfied that all concerns have been addressed, or can be addressed before the chemical is brought in (or used for a new purpose).

HAZARD COMMUNICATION

Material Safety Data Sheets (MSDSs)

No chemical will be allowed to enter the MHATT CAT facilities without a current, manufacturer-provided MSDS. A copy of the MSDS will be given to the MHATT CAT Sector Manager, who will file it with other MSDSs and verify that the chemical appears on the List of Hazardous Chemicals. Additional copies of the MSDS will be filed in the Laboratory Information Binder for each MHATT CAT work area where the chemical is to be used and with the Office of the XFD ES&H Coordinator. All MHATT CAT personnel will have access to both MHATT CAT sets of MSDSs.

Container Labels

All containers holding hazardous chemicals in MHATT CAT's facilities at the APS will be labeled in accordance with OSHA requirements (see REFERENCES). MHATT CAT will rely on the veracity, accuracy, and sufficiency of the manufacturer-affixed labels on the original containers. MHATT CAT personnel shall not remove manufacturer-affixed labels. If MHATT CAT personnel transfer hazardous chemicals to other containers, those containers shall be labeled, at a minimum, with:

- The name of the chemical that appears on the original container and the Material Safety Data Sheet; and
- Appropriate hazard warnings, including known health effects.

MHATT CAT permits the use of NFPA 704 labels providing they contain additional text describing health effects and other specific hazard warnings.

Training

MHATT CAT requires all personnel using its facilities to have all the training required by OSHA with regard to the chemicals being used in their work area. Supervisors and Principal Investigators are responsible for providing personnel working under their direction with this information, which includes the following:

- Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area;
- The physical and health hazards of the chemicals in the work area; and
- The measures that can be taken to protect oneself from these hazards, including specific procedures required by MHATT CAT, the use of personal protective equipment and engineered controls specified by MHATT CAT, and appropriate emergency procedures.

MHATT CAT and its personnel may, as is appropriate on a case-by-case basis, use the training capabilities of Argonne National Laboratory and the APS to satisfy chemical-specific training requirements.

List of Hazardous Chemicals

Immediately upon the arrival of a chemical in the MHATT CAT facilities at the APS, responsible MHATT CAT personnel will complete a copy of the Chemical Container Tracking Form (available from the Office of the XFD ES&H Coordinator) and give it to the MHATT CAT Safety Coordinator or designee. One form must be filled out for each container holding a hazardous chemical or—for items not in containers—for each item.

The MHATT CAT Safety Coordinator will review the form, verifying the pre-approval for the introduction and use of the chemical at MHATT CAT's APS facilities. The form will then go to the MHATT CAT Sector Manager, who will forward a copy to the Office of the XFD ES&H Coordinator for updating of the on-line APS Chemical Management System. The MHATT CAT Sector Manager will write in the name of the chemical on the current MHATT CAT List of Hazardous Chemicals, and file the form.

When a chemical container is emptied, the Sector Manager will retrieve the form corresponding to that container, update the "Quantity on Hand" field, and send another copy of the form to the Office of the XFD ES&H Coordinator.

MHATT CAT will periodically receive a printout of the updated MHATT CAT List of Hazardous Chemicals from the Office of the XFD ES&H Coordinator.

MHATT CAT will not require researchers using the MHATT CAT facilities to submit the above-mentioned form for each group of samples to be analyzed in MHATT CAT's APS facilities.

Information on Hazardous Chemicals Used in Neighboring Sectors

MHATT CAT personnel may request information on chemicals used in neighboring CAT sectors through the Office of the XFD ES&H Coordinator or from an APS Floor Coordinator.

CHEMICAL HYGIENE REQUIREMENTS

MHATT CAT's Chemical Hygiene Plan, including the laboratory-specific requirements of the plan, is contained in the Laboratory Information Binder(s) maintained in the lab(s) where the hazardous chemicals are being used. See the *MHATT CAT Guideline on Laboratory Information Binders* for additional guidance.

REFERENCES

For more information on the management of hazardous chemicals, see the OSHA Hazard Communication Standard, Title 29 CFR 1910.1200, or Chapter 4 of the *ANL ESH Manual*.

4.7 MHATT CAT GUIDELINE FOR THE MANAGEMENT OF HAZARDOUS WASTE

INTRODUCTION

Purpose

The procedures described in this guideline are intended to keep the MHATT CAT's APS operations in compliance with Resource Conservation and Recovery Act (RCRA) requirements and Argonne National Laboratory policies, and minimize the environmental impact caused by use of the MHATT CAT facilities at the APS.

Definitions

- **Hazardous waste:** any unwanted, nonrecyclable, unsalvageable solid, liquid, or gaseous material that is considered hazardous if released without treatment or control into the environment. A listing of detailed criteria for characterizing materials as hazardous waste is available from the Office of the XFD ES&H Coordinator.
- **Waste generator:** the person whose work with a material first caused the material to become a (hazardous) waste.
- **Process knowledge:** the waste generator's knowledge of the source, use, handling, and storage of a material, particularly about the potential for radioactive contamination by activation or cross contamination.
- **Satellite Accumulation Area:** a demarcated area set aside for the temporary storage of hazardous waste at or near the point of generation. Wastes in a Satellite Accumulation Area (SAA) are under the control of the waste generator.

Applicability & Scope

This guideline applies to all personnel working at the MHATT CAT's APS facilities and to materials that are hazardous waste or might reasonably be predicted to become hazardous waste. It does not address radioactive materials.

ROLES & RESPONSIBILITIES

Waste Generators

- Minimize the volume and toxicity of wastes through advanced planning and control of work methods;
- Communicate anticipated waste storage requirements to the appropriate Laboratory Safety Captain or Chemical Safety Coordinator;

- Manage the handling and documentation of waste so that it can be disposed of by Argonne National Laboratory legally, efficiently, and cost-effectively;
- Establish process controls capable of ensuring that nonradioactive materials are not activated or contaminated with radioactive materials;
- Maintain pertinent information about the hazardous waste.
- Properly label hazardous waste containers, providing the name of the waste generator, the container's contents, and the percentages by volume of each hazardous waste;
- Properly package and store the container in an approved Satellite Accumulation Area;
- Advise the Laboratory Safety Captain if the stored waste requires disposal; and
- Complete Form EWM-197, the Chemical Waste Disposal Requisition and Certification Form for Chemical Waste. The Laboratory Safety Captain will provide assistance.

Laboratory Safety Captains

- Complete Chemical Waste Generator Training (ESH Course #574) and Waste Certification Training (ESH Course #456);
- Provide guidance on the use of SAAs in laboratories for which they are responsible;
- Ensure that all hazardous wastes are properly stored and labeled;
- Periodically inspect SAAs in their laboratories;
- Assist in the completion of Form EWM-197 (Chemical Waste Disposal Requisition and Certification Form for Chemical Waste); and
- Arrange for disposal by ANL EMO-Waste Management Operations.

Chemical Safety Coordinator

- Complete Chemical Waste Generator Training and Waste Certification Training;
- Inform the Sector's APS Floor Coordinator about planned activities that are expected to generate non-routine or large quantities of hazardous wastes;
- Arrange for required containers for expected hazardous wastes; and

- Maintain a supply of EWM-197 forms and SAA Inspection Checklists. (These are available from the Office of the XFD ES&H Coordinator.)

WASTE HAZARD CONTROLS

PLANNING

MHATT CAT will advise all personnel working at its APS facilities, including all visiting users, of the importance of maintaining process knowledge so that wastes can be certified as required by the *ANL Waste Handling Procedures Manual*. All visiting users will also be requested to identify to the MHATT CAT Safety Coordinator or Chemical Safety Coordinator the hazardous waste likely to be generated during their stay at the APS. The MHATT CAT Safety Coordinator or Chemical Safety Coordinator will use this information to arrange for the proper handling, storage, and disposal of the wastes. These arrangements include requesting appropriate storage containers from the ANL EMO-Waste Management Operations group.

MHATT CAT staff based at the APS who expect to generate hazardous waste shall complete the ANL Chemical Waste Generator and Waste Certification Training courses. These courses are not currently available on demand, so early planning and registration are important. Details on these courses and schedule information can be obtained through the Office of the XFD ES&H Coordinator.

Visiting researchers and others spending relatively short amounts of time at the APS will follow the guidance in the *APS User Safety Guide* for the management of hazardous waste.

Waste Accumulation Areas

MHATT CAT will establish SAAs as needed. Each SAA will be under the control of the waste generator. A description of requirements for SAAs is available from the Office of the XFD ES&H Coordinator.

Waste Logbooks

Persons responsible for SAAs shall keep a Waste Logbook to document inspection data (including dates, findings, and the identity of the person performing inspections) and additions of wastes to the SAA (including dates, the identities of the materials, approximate amounts, the identities of the containers to which materials are added, and the names of persons making entries).

Waste Receptacles

Waste generators shall use the containers provided by EMO to hold wastes awaiting disposal. The waste generators shall label the containers according to instructions provided by the Chemical Safety Coordinator.

Waste receptacles will be kept out of radiologically controlled areas whenever possible. If a container must be placed in a controlled area, the waste generator shall take all steps necessary to prevent radioactive contamination of the waste.

Any person who creates unforeseen hazardous waste should immediately contact the Chemical Safety Coordinator who, in turn, will arrange for a container and for the disposal of the waste. **Under no circumstances should a person add a waste to any container other than one assigned for the disposal of that waste.** Persons who improperly add hazardous waste to any other container are subject, as individuals, not only to MHATT CAT-imposed sanctions, but possible federal enforcement action and penalties.

Waste Certification

MHATT CAT personnel will base waste certification on reliable process knowledge. When such knowledge is lacking, the Chemical Safety Coordinator will arrange for analysis of a container's radiological content as specified by ANL EMO, at the waste generator's expense.

In those instances where Chemical Waste Disposal Requisitions have been completed by waste generators who have not completed ANL Chemical Waste Generator Training and Waste Certification Training, the Chemical Safety Coordinator, if available, or Safety Coordinator will countersign the form as an indication that he or she believes that the information is accurate.

STEPS TO FOLLOW WHEN DISPOSING OF HAZARDOUS WASTE

1. Before producing a hazardous waste, the generator should consult with the MHATT CAT Chemical Safety Coordinator reviewing the operation to consider the steps that can be taken to minimize the amount and toxicity of the waste and provide for safe handling and storage.
2. For incoming MHATT CAT personnel, this dialog should begin before arrival at the APS. Pertinent information should always be included in the experiment safety review submissions.
3. Waste generators shall place hazardous wastes in receptacles provided by the Chemical Safety Coordinator (who will obtain them through ANL EMO-Waste Management Operations). Prior to the first addition of waste to a container, the generator will label the receptacle as instructed by the Chemical Safety Coordinator. At the time of each addition, the waste generator will document the addition of waste in the Waste Logbook for the SAA. At least once a month, the waste generator will inspect the area as indicated in the SAA Inspection Checklist, which is available from the Chemical Safety Coordinator, and will document the inspection data in the Logbook.
4. When containers are filled to 75% or more of capacity or upon completion of the activities that generated these wastes, generators will complete Chemical Waste Disposal Requisitions (Form EWM-197), available through the Chemical Safety Coordinator. (Generators who cannot, based on reliable process knowledge, complete Sections A and B of the Certification Form with an assertion that the waste is free of radioactive contamination must notify the Chemical Safety Coordinator. The Chemical Safety Coordinator will make necessary arrangements for analysis through the APS.)

5. Waste generators or, in the case of visiting researchers, the Chemical Safety Coordinator will contact the APS Floor Coordinator to arrange for required surveys and pick-up by ANL Waste Management Operations.

REFERENCE

- Waste Handling Procedures Manual, Argonne National Laboratory.

4.8 MHATT CAT GUIDELINE FOR MANAGEMENT OF SEALED RADIOACTIVE CALIBRATION SOURCES

INTRODUCTION

This policy describes the management of low-activity, sealed radioactive calibration sources for use by MHATT CAT personnel at the APS. The guidelines are based on Chapter 5-20 of the *ANL ESH Manual*. It should be noted that sources brought on site for periods of less than 60 days are exempt from the provisions of Chapter 5-20.

ROLES & RESPONSIBILITIES

1. The source custodian for MHATT CAT will be the Laboratory Safety Captain for the laboratory in which the sealed sources are maintained, as described in Section 2.1 of this document. If that person is unavailable, the MHATT CAT Safety Coordinator will act as the alternate source custodian. The source custodian will maintain a list of authorized users for each source, and will provide the list and updates to the XFD Sealed Source Inventory Database (SSID) Coordinator.
2. MHATT CAT will complete a New Source Entry Form (available from the Office of the XFD ES&H Coordinator) and submit it to the XFD SSID Coordinator as soon as possible after a new source arrives at the APS.
3. The MHATT CAT custodian will ensure that the sources are properly labeled, stored, and tested for integrity on a periodic basis as described in Chapter 5-20. The custodian will also be responsible for knowing the location of all sources at all times and will ensure that all necessary records are maintained. The Sealed Source Checkout Record (see attached sample) will be used for that purpose.
4. To comply with 49 CFR 173, MHATT CAT will make advance arrangements with the ANL Special Materials Section for the shipment of radioactive sources to the APS site and between buildings on the site. Prior to shipment, Special Materials Section personnel will assign a control number to the shipment and will provide instructions on the proper packaging, labeling, and addressing of the shipment.

Sealed Source Checkout Record

[illegible]

4.9 MHATT CAT GUIDELINE FOR HOISTING AND RIGGING OPERATIONS

INTRODUCTION

Purpose

This document provides basic guidelines for hoisting and rigging activities conducted by MHATT CAT personnel working at the APS. These guidelines are designed to reduce the risks associated with these operations and ensure compliance with all applicable standards and laboratory requirements.

Scope & Applicability

The training and user approval requirements defined below apply to all MHATT CAT personnel working with hoists and cranes at the APS. The equipment acceptance protocol applies to all hoists, cranes, slings, chain, etc., brought to the APS by MHATT CAT.

MHATT CAT Hoisting & Rigging Experts

The MHATT CAT Safety Coordinator [or other individual selected by the CAT] and—if appropriate—other MHATT CAT personnel will satisfy the training and qualification requirements specified by ANL for incidental crane operators. Only MHATT CAT personnel who have completed such training are authorized to approve operators and make determinations about the suitability and operating condition of hoisting and rigging equipment and perform the other training, evaluation, and oversight functions described below.

References

This guidance document is based on the following sources:

- The American Society of Mechanical Engineers B30 Series standards;
- The U. S. Department of Energy *Hoisting and Rigging Manual*;
- The *ANL ESH Manual*; and
- The Argonne National Laboratory-East *Hoisting and Rigging Manual*.

HOISTING AND RIGGING EQUIPMENT

MHATT CAT personnel who wish to bring hoisting and rigging equipment to the MHATT CAT sector at the APS shall complete the following procedure before the equipment is put into service. Equipment brought to the APS without following this procedure may not be used at the APS.

[If the equipment is being procured by an ANL division and charged to an ANL divisional account rather than another institution's user account, the procurement must be in full compliance with the ANL-E *Hoisting and Rigging Manual*.]

Acceptance Procedure

1. The user ensures that equipment to be brought to the APS has, as appropriate,¹ manufacturer-affixed load ratings, etc.;
2. The user gives the MHATT CAT Safety Coordinator a description of the equipment and its intended use; and
3. The user provides the MHATT CAT Safety Coordinator with a copy of any certification or manufacturer-conducted testing documentation associated with the equipment. If the equipment has not been certified or tested by the manufacturer, the user has it tested or inspected by a recognized crane-testing organization that is approved by the MHATT CAT Safety Coordinator, and gives the Safety Coordinator a copy of the resulting documentation. (The original documentation shall be filed in the MHATT CAT offices at the APS when the equipment is moved to the site.)
4. The MHATT CAT Safety Coordinator determines if the equipment is suitable for the intended use;
5. The MHATT CAT Safety Coordinator inspects the equipment and documents his/her acceptance (inspection checklists are available from the Office of the XFD ES&H Coordinator) and files the acceptance document with the certification and testing or inspection reports for the equipment; and
6. The MHATT CAT Safety Coordinator notifies the appropriate APS Floor Coordinator of the arrival of the equipment, its intended use, and its location by providing the Floor Coordinator with a copy of the Hoisting Equipment Data Sheet shown in Appendix A.
7. The APS performs a cursory inspection of the equipment. Note: Passing this inspection does NOT constitute an approval or certification of the equipment by ANL.
8. The MHATT CAT Safety Coordinator tags the equipment with the information shown in Appendix B.

Other Requirements

- The MHATT CAT Safety Coordinator or other MHATT CAT personnel will perform or arrange for the daily, weekly, monthly, and yearly inspections of the equipment as required by the ANL-E *Hoisting and Rigging Manual* and will document the inspections (inspection checklists are available from the Office of the XFD ES&H Coordinator). Records shall be filed in the MHATT CAT

¹ In general, "as appropriate" means if required under one of the ASME B30 Series standards.

office and will be made available for inspection by the CAT Safety Coordinator and APS ES&H personnel.

- The MHATT CAT Safety Coordinator shall periodically check logs to insure that the inspections have been performed as required by the ANL-E *Hoisting and Rigging Manual*.

OPERATOR AUTHORIZATION TO PERFORM HOISTING & RIGGING

If the possibility exists that a proposed lifting operation could affect the APS storage ring or another CAT's sector, the MHATT CAT Safety Coordinator will discuss the planned operation with the APS Floor Coordinator or the XFD ES&H Coordinator. If that person agrees that this possibility exists, the APS will arrange for the operation to be done by ANL Plant Facilities and Services personnel.

If hoisting and rigging equipment is to be operated by an ANL employee, the operator training and certification must be in full compliance with the ANL-E *Hoisting and Rigging Manual*.

In all other cases, the following process is used to authorize individuals to use hoisting equipment in the MHATT CAT sector:

1. The prospective operator submits a completed Crane Operator Questionnaire (see Appendix C) to the MHATT CAT Safety Coordinator.
2. The MHATT CAT Safety Coordinator determines whether the user's training and experience is suitable for the equipment to be used.
3. The MHATT CAT Safety Coordinator informs the user of the additional training, if any, needed to use the equipment. As appropriate, the MHATT CAT Safety Coordinator may arrange for training through the XFD Training Management System Representative.
4. The MHATT CAT Safety Coordinator provides qualified candidates with an orientation to the hoisting and rigging equipment they need to use and describes the applicable requirements and limitations.
5. The MHATT CAT Safety Coordinator logs the name of each qualified candidate and sends a copy of the log to the appropriate APS Floor Coordinator.

APPENDIX A
HOISTING EQUIPMENT DATA SHEET

EQUIPMENT TYPE: _____

MANUFACTURER: _____

MODEL#_____ **SERIAL#**_____

LOAD RATING: _____

EQUIPMENT I.D.: _____

INTENDED USE: _____

**LOCATION OF EQUIPMENT
CERTIFICATION/TESTING
DATA:** _____

APPENDIX B

**HOISTING EQUIPMENT
IDENTIFICATION TAG**

TYPE:	<hr/>
I.D. #	<hr/>
DATE OF ARRIVAL AT THE APS:	<hr/>
SAFETY COORDINATOR: (SIGNATURE AND DATE)	<hr/>
APS FLOOR COORDINATOR: (SIGNATURE AND DATE)	<hr/>
DATE IN SERVICE:	<hr/>
NEXT INSPECTION DATE:	<hr/>

APPENDIX C
CRANE OPERATOR QUESTIONNAIRE

Date _____

Operator _____ CAT _____

Telephone _____

Supervisor _____

Briefly describe the type/s of lifting device/s to be used and the expected weightloads.

Lifting Device	Weight Load
_____	_____
_____	_____
_____	_____
_____	_____

Operator training/experience operating a crane or other lifting device:

Date/Description of Training:

I certify that, to the best of my knowledge, I have normal depth perception, field of vision, reaction time, manual dexterity, and coordination, and do not have a

detectable or known disease or physical malfunction that would render me incapable of safe operation or rigging duties.

Candidate's signature

4.10 MHATT CAT GUIDELINE FOR MHATT CAT SECTOR ORIENTATION

INTRODUCTION

The orientation described in this guideline is designed to provide the basic information needed by new users to make safe and effective use of MHATT CAT's facilities at the APS. The MHATT CAT will also give appropriate parts of this orientation to visitors who are not expected to do hands-on work in MHATT CAT's facilities.

CONTENTS OF THE ORIENTATION

Part 1: APS Requirements

MHATT CAT will ensure that prospective *visitors* are aware that they must:

- Register with the APS User Office and receive an appropriate safety orientation upon arrival and
- Never enter a controlled area unescorted.

MHATT CAT will inform prospective *principal investigators* that they must:

- Contact the APS User Office prior to arrival for guidance on registration;
- Complete the APS User Orientation and radiation safety training required by ANL and the APS before a permanent film badge is issued;
- Describe probable activities at the APS, complete any additional safety training that MHATT CAT or the APS specifies for those activities, and comply with hazard control measures specified by the MHATT CAT;
- Complete sector-specific training as outlined below (MHATT CAT will provide this training); and
- Identify on the Experiment Safety Review Form all chemicals, gases, and samples to be used in experiments at the APS.

Part 2: MHATT CAT Safety Policies and Resources

The CAT member covering the safety policies and resources portion of the sector orientation shall:

- Give the user an orientation to the *Environmental, Safety, & Health Plan of the MHATT CAT*;
- Call attention to the section entitled "General Policies" out that, as stated there, this manual is intended to supplement the analogous documents of ANL, APS, and the MHATT CAT member institutions;

- Emphasize that the **safety first** principle is the primary tenet for performing any job, task, or experiment at MHATT CAT's facilities, and that the success of the MHATT CAT safety and environmental protection effort depends on the commitment of all MHATT CAT personnel;
- Introduce the user to the MHATT CAT Safety Coordinator and the MHATT CAT Sector Manager; and emphasize the importance of bringing all safety and environmental problems and concerns to their attention.

Part 3: General Safety Information

The MHATT CAT member covering this portion of the sector orientation shall review the following topics:

- Locations of safety equipment (fire extinguisher, shower, eyewash station, stocks of personal protective equipment, etc.);
- Location of safety documentation;
- Location of emergency phone numbers;
- Responding to alarms and other warnings;
- Use of safety glasses and other personal protective equipment;
- Restrictions on working alone;
- The importance of keeping work areas neat and orderly, and the aisles free of obstructions;
- Proper storage of chemicals and gas cylinders;
- Proper storage of other items (e.g., objects may not be stored on top of cabinets); and
- Securing electrical power strips.

Part 4: MHATT CAT Beamline Safety Practices

The MHATT CAT member covering this portion of the sector orientation shall:

- Explain the APS Shielding Configuration Policy;
- Point out the locations of the utility shutoffs for water and compressed gases;
- Discuss the use of radiation survey meters; and
- Explain the general and beamline-specific operation of the PSS, including:
 1. The APS policy that no one is allowed in the First Optics Enclosures (FOEs) or the Experimental Stations (ESs) when the beam is on or when the interlocks are enabled,
 2. Use of the Beamline Padlock Checkout List,

3. Use of the Beamline Safety Checkout List,
4. The inspection and interlock procedures used at the beamline,
5. The safety interlock system and fail-safes,
6. The locations of the Emergency Beam Dump switches in the FOEs and ESs, and
7. The locations of the electrical circuit breakers and main breakers for the beamline.

MHATT CAT trainers will also provide the user with additional formal and on-the-job training that is specific to the MHATT-CAT beamlines, instruments, and facilities that the user will be using.

DOCUMENTATION

MHATT CAT will document each person's attendance at the sector orientation by recording the name of the attendee, the date(s) of the training, and the signature of the person who conducted the training. Training records will be kept on file by the MHATT CAT Sector Manager.

4.11 MHATT CAT GUIDELINE FOR LOM LABORATORY INFORMATION BINDERS

INTRODUCTION

Purpose and Scope

This guideline provides a model MHATT CAT LOM Laboratory Information Binder; the binder is one of the primary means that the CAT will use to provide information on hazards and controls to the individuals using the MHATT CAT LOM laboratories. The model contains explanatory text (in italics) to assist MHATT CAT in adding the specific information that is required.

Responsibilities

MHATT CAT Laboratory Safety Captains are responsible for developing and maintaining a Laboratory Information Binder for each LOM laboratory occupied by or managed by MHATT CAT.

Principal Investigators are responsible for keeping Laboratory Safety Captains well informed about their activities so that necessary modifications to the Laboratory information Binders can be made in a timely manner and other laboratory users can be informed before new hazards are introduced.

Laboratory Information Binder for [Identify laboratory]

**In an emergency, DIAL 911 FIRST,
then notify other individuals as indicated below.***

Title	Name	Office Phone, Pager	Office Room No.
Laboratory Safety Captain			
APS Floor Coordinator (Area Emergency Supervisor)	Kevin Beyer David VanWingeren	2-0200 2-0201	Bldg. 432 Rm. C001
MHATT CAT Sector Manager	Steve Dierker	734-764-5276	Bldg. 432 Rm. D000
MHATT CAT Safety Coordinator	Eric Dufresne	2-0274	Bldg. 432 Rm. D007
MHATT CAT Chemical Safety Coordinator	Eric Dufresne	2-0274	Bldg. 432 Rm. D007
MHATT CAT Electrical Safety Coordinator	Eric Dufresne	2-0274	Bldg. 432 Rm. D007
MHATT CAT Laser Safety Coordinator	Eric Dufresne	2-0274	Bldg. 432 Rm. D007
AOD ES&H Coordinator	Jim Lang	2-7021 4-1585	Bldg. 401 Rm. C4244

*After summoning help via 911, notify the MHATT CAT Sector Manager. If he/she is unavailable, notify the APS Floor Coordinator.

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LABORATORY-SPECIFIC USER RESPONSIBILITIES

This section should be short. It should summarize laboratory-specific responsibilities in a manner that clearly indicates the criteria that trigger each responsibility. For example, a person using an x-ray generator under the direct supervision of another person might not have the same responsibilities as the person directing the work. A reasonable breakdown for subsections might be:

ALL USERS

USERS OF [SPECIFY EQUIPMENT]

PERSONNEL PERFORMING [SPECIFY OPERATION]

PERSONNEL HAVING EQUIPMENT/FACILITY MANAGEMENT RESPONSIBILITIES

Laboratory Safety Captains, Satellite Accumulation Area Custodians, Radioactive Source Custodians, X-ray Generator Custodians, etc.

HAZARD IDENTIFICATION AND CONTROL

This section should consist of one or more two-column tables. As illustrated below, the first column should list each significant hazard that could be present in the laboratory and the circumstances that create or significantly increase the risk associated with the hazard. The second column should briefly summarize the hazard-specific controls applicable to each hazard. Where appropriate, cite references to more detailed information.

Hazard	Associated Hazard Control

The following are some guidelines for developing control summaries for various classes of hazards.

CHEMICAL HAZARDS

The starting point for identifying appropriate controls for a given chemical is the MSDS. Controls include appropriate storage facilities, fume hoods, personal protective equipment, written handling procedures, etc.

FIRE HAZARDS

The majority of fire hazards will fall into one of the following categories:

- *The use of easily ignited substances such as readily combustible solids, flammable liquids, combustible liquids, and flammable gases; and*
- *Operations that require open flames or produce sparks.*

Controls for both categories of hazards are described in the ANL ESH Manual.

CRYOGENIC HAZARDS

Closed loop liquid nitrogen cooler for high heat load Monochromator. Procedure for delivery of liquid nitrogen to users. Use of liquid nitrogen for solid state detectors and boil off gas for venting vacuum systems.

ELECTRICAL HAZARDS

Electrical hazards commonly found in MHATT CAT facilities include those posed by high voltage power supplies, high amperage power supplies, and electronic and electrically powered equipment. Such equipment, whether purchased from an outside source or built by MHATT CAT personnel, should incorporate safeguards that virtually eliminate any chance of contacting an energized part. Equipment lacking such safeguards must be listed in this section of the binder. Equipment that has safeguards in place need not be listed unless it is used, tested, or serviced in a manner that requires the safeguards to be defeated. In the latter case, the equipment should be listed here and the procedures included in Appendix C of this binder. Safeguards appropriate to various electrical hazards are covered elsewhere in the MHATT CAT ES&H Plan.

IONIZING RADIATION HAZARDS

These include x-ray generators and all radioactive sources. Hazard controls that are addressed in the ANL ESH Manual and which do not require supplemental efforts need not be described in detail. Facility- or equipment-specific procedures and controls should be identified with enough detail for all users to understand whether the control is in place.

PRESSURE HAZARDS

These are hazards posed by apparatus with vacuum chambers, or equipment that contains gases or liquids at pressure that are significantly lower or higher than atmospheric pressure.

At the time of this writing, ANL's pressure safety program is undergoing significant revision. Planned controls should be reviewed with the XFD ES&H Coordinator to help ensure that they will satisfy current requirements.

GENERAL HAZARD CONTROLS AND EMERGENCY EQUIPMENT

CHEMICAL STORAGE

List what is available along with its applicability and limitations, its capacity and normal contents, and reference to chemical inventory management procedures. Include Hazardous Waste Satellite Accumulation Areas. For example:

This laboratory has cabinets that meet the requirements for storage of flammable liquids, corrosives (both acids and bases), and oxidizers. A label on each cabinet door lists the types of chemicals that may be safely stored in that cabinet, and incompatible chemicals that may not be stored there.

The laboratory has a chart, "Safe Storage of Chemicals," that provides additional guidelines on the safe storage of chemicals.

No chemicals may be stored in this laboratory without the prior approval of the Laboratory Safety Captain.

UNCONTROLLED CHEMICAL RELEASES

Describe the applicability and limitation of available spill kits, their storage location, criteria for deciding whether MHATT CAT personnel should clean up a particular spill themselves, personnel to be notified in the event of a spill, and training required to use a spill kit. For example:

This laboratory has spill kits that may be used to control small spills of flammable liquids, bases, and acids. The respective storage locations of these kits are as follows:

- Acids -
- Bases -
- Flammable Liquids -

ENGINEERED CONTROLS

List the controls that have been built into the facility and describe their applicability and limitations, and required authorizations.

PERSONAL PROTECTIVE EQUIPMENT

List what is available along with its applicability and limitations, and any authorization required to use the equipment.

EMERGENCY EQUIPMENT

List what is available along with its applicability and limitations, and any authorization required to use the equipment.

DESIGNATED AREAS

Describe designated areas. Include a statement describing the specific purpose of each area (including specific hazardous materials that will/may be handled there) and the methods to be used to demarcate and post the area. Make reference to procedures in Appendix C of this binder that require use of designated areas as a hazard control measure.

INSPECTION CHECKLIST

The inspection checklist should include those actions and tests necessary to verify the continued effectiveness of both hazard-specific and general controls. The checklist in Appendix A can be adapted to meet the needs of the laboratory.

The Laboratory Safety Captain will conduct monthly inspections using criteria in the Inspection Checklist shown in Appendix A. The Laboratory Safety Captain will use the completed checklist to identify needed corrective actions and will ensure that identified deficiencies are corrected in a timely manner.

LIST OF HAZARDOUS CHEMICALS AND WASTES

See Appendix B.

PROCEDURES

See Appendix C.

CONTACT INFORMATION

Contact information for key personnel appears on the cover sheet of this binder.

CHEMICAL HYGIENE PLAN

This section can be deleted for laboratories that are not subject to the requirements set forth in 29 CFR 1910.1450. For laboratories that require a plan, this section shall incorporate both the general elements indicated below and complementary laboratory-specific elements or information. This section should explicitly cite information found elsewhere in this LOM Laboratory Information Binder.

The MHATT CAT and this laboratory have implemented a Chemical Hygiene Plan that follows the guidelines established by Chapter 4-2 of the ANL ESH Manual. (A copy of Chapter 4-2 is available from the MHATT CAT Sector Manager.) The remainder of this section describes MHATT CAT- and laboratory-specific policies, controls, and procedures.

GENERAL GUIDELINES

- Use all reasonable precautions to minimize exposure to toxic substances by any route.

- Use and store substances with high acute toxicity or moderate-to-high chronic toxicity only in areas of restricted access with special warning signs.
- Always use a hood or other containment device for procedures which may result in the generation of aerosols or vapors containing the substance. Make sure the system has a cleaner that will trap released contaminants to prevent their discharge with the hood exhaust.
- Always avoid skin contact by use of gloves, long sleeves and other protective apparel as appropriate. Always wash hands and arms immediately after working with materials posing high acute toxicity or moderate to high chronic toxicity.
- Store breakable containers of these substances in chemically resistant trays; also work and mount apparatus above such trays or cover work and storage surfaces with removable, absorbent, plastic backed paper.
- If a major spill occurs outside the hood, evacuate the area. Make sure cleanup personnel wear suitable protective apparel and equipment.
- Be prepared for accidents and spills.
- Make sure at least two people are present at all times if a compound in use is highly toxic or of unknown toxicity.
- Thoroughly decontaminate or properly dispose of contaminated clothing or shoes.
- Store contaminated waste in closed, suitably labeled, impervious containers that comply with EMO-WMO recommendations.
- For materials with high acute toxicity or moderate-to-high chronic toxicity, maintain records of the amounts on hand, amounts used, and the names of the workers involved.
- Protect vacuum pumps against contamination by scrubbers or HEPA filters and vent them into the hood. Decontaminate vacuum pumps or other contaminated equipment, including glassware, in the hood before removing them from a designated area. (See below.)

(Add other guidelines as appropriate.)

STANDARD OPERATING PROCEDURES

If a proposed laboratory operation requires the use of chemicals, the Principal Investigator must inform the MHATT CAT Safety Coordinator of the chemicals and processes involved. If the Safety Coordinator determines that the operation is subject to the requirements imposed under 29 CFR 1910.1450 or that it involves other significant hazards, he or she will advise the Principal Investigator that the proposed operation must follow a standard operating procedure. If no such procedure exists for the operation, the Principal Investigator will write one, and the Laboratory Safety Captain will approve it in consultation with the MHATT CAT Chemical Safety Coordinator.

Appendix C contains copies of all standard operating procedures for this laboratory.

CRITERIA AND PROCEDURES USED TO DETERMINE CONTROLS

The safety review procedures described in the *MHATT CAT ES&H Manual* will be used to determine the need for controls, including available procedural controls. In addition, the MHATT CAT Safety Committee may call for the implementation of a procedural or an engineered control. In general, the Safety Coordinator will arrange for any required reviews of engineered chemical exposure controls and personal protective equipment.

The hazard controls for chemicals used in this laboratory are described in the “General Hazard Controls and Emergency Equipment” section of this Laboratory Information Binder.

MEASURES TO ASSURE PROPER OPERATION OF HAZARD CONTROL EQUIPMENT

Eyewash units will be tested weekly by the Laboratory Safety Captain or designee.

Drench showers will be tested semi-annually by ANL-PFS.

ANL-ESH-IH shall be requested to categorize hoods and verify proper air flow at the time new units are installed. PFS-Building Maintenance will test the hoods when installed and annually thereafter. The Laboratory Safety Captain will check the airflow of each chemical fume hood during monthly inspections. Users will take note of readings on instruments that measure hood performance and indicate problems.

(Add other measures as appropriate.)

PROVISIONS FOR LABORATORY WORKER INFORMATION AND TRAINING

This Laboratory Information Binder contains the basic information that trained personnel will need to work safely in this laboratory.

The Laboratory Safety Captain will provide an orientation to each person authorized to work in the laboratory. The content of the orientation will follow a graded approach; that is, it will be commensurate with the person’s planned activities. During the orientation, the Laboratory Safety Captain will make use of this LOM Laboratory Information Binder.

As appropriate, personnel shall complete substance-specific training before working with chemicals.

(Add other provisions as appropriate.)

MEDICAL CONSULTATIONS AND EXAMINATIONS

MHATT CAT personnel shall keep their home institutions informed about any toxic materials to which they might be exposed in their work. MHATT CAT will rely on the home institutions to determine medical monitoring requirements.

PERSONNEL RESPONSIBLE FOR IMPLEMENTATION OF CHEMICAL HYGIENE PLAN

All MHATT CAT personnel authorized to work in this laboratory are responsible for complying with the work rules described in this LOM Laboratory Information Binder and any additional rules imposed by the Laboratory Safety Captain.

The Laboratory Safety Captain is responsible for ensuring that the requirements of this Chemical Hygiene Plan are implemented.

The MHATT CAT Safety Coordinator is responsible for providing required technical expertise and for conducting surveillance.

DESIGNATED AREAS

All storage and handling of high-toxicity materials, select carcinogens (see *ANL ESH Manual* Chapter 4-2), and reproductive toxins shall take place in a restricted-access area (hood, glove box, or portion of the laboratory) designated for use of highly toxic substances. All personnel with access to the area will be aware of the substances being used and necessary precautions.

The designated areas in this laboratory for the storage and handling of highly toxic substances, and the substances to be stored/handled there, are listed in the “Designated Areas” section of this Laboratory Information Binder.

On leaving a designated area, remove any protective apparel (placing it in an appropriate, labeled container) and thoroughly wash hands, forearms, face, and neck.

In the event of a spill or leak, decontaminate the designated area before normal work is resumed there. Use a wet mop or a vacuum cleaner equipped with a HEPA filter instead of dry sweeping if the highly toxic substance was a dry powder.

APPENDIX A:
LOM LABORATORY INSPECTION CHECKLIST
FOR [IDENTIFY LABORATORY]

Date: ____ / ____ / ____

General		
Status	Criterion	Comment
	General housekeeping	
	Required hazard warnings are posted at entrance(s)	
	MSDS binder is in place at the main entrance to laboratory	
	LOM Laboratory Information Binder is in place at the main entrance to laboratory	
	The contact information on the cover sheet of the LOM Laboratory Information Binder is current	
	List of authorized laboratory users is posted at entrances	
	Paths of egress are free of obstructions	

Electrical Safety		
Status	Criterion	Comment
	Lights in hoods protected from vapors	
	Circuits and circuit breakers labeled	
	Extension cord usage is minimized	

	Extension cords are not connected in series	
	No circuits overloaded with extension cords or multiple connections	
	Heating apparatus equipped with redundant temperature controls	

Fire Safety		
Status	Criterion	Comment
	All flammable liquids not in use are stored in flammable-liquids storage cabinets	
	Excessive quantities of flammable material stocks are not present	
	Oxidizers and other incompatible materials are not present in flammable-liquid storage cabinets	
	At least two well-marked means of egress from laboratory, each clear of obstructions	
	Class ABC fire extinguisher is located along path of egress, and not obscured or obstructed	
	Flammable materials not stored along paths of egress from laboratory	
	Refrigerators used for flammables are flammable material storage units or are explosive-proof	
	UL-approved electrical equipment is used in locations/operations involving flammable liquids	

Chemical Handling		
Status	Criterion	Comment
	Chemicals stored according to compatibility in appropriate storage cabinets	
	All chemicals stored at safe levels in cabinets or on stable shelving	
	Stored quantities of chemicals not excessive	
	All containers are appropriately labeled (contents, warnings, bar codes)	
	Containers holding ethers and other compounds with safe shelf life are labeled with latest date for disposal	
	Gas cylinders strapped firmly in place	
	Gas cylinders not in use are capped	
	Gas cylinders of oxidizing and reducing agents are properly segregated	
	Glass vacuum vessel taped	
	All work generating toxic and hazardous fumes done in hoods	
	Apparatus susceptible to damage is marked with warning signs or protected by barriers	
	Chemical waste log is current, bearing notations indicating inspections have been performed on each waste container	

	Chemical waste labeled and stored in designated Satellite Accumulation Areas according to compatibility and class	
--	---	--

Ventilation		
Status	Criterion	Comment
	Laboratory at negative pressure with respect to corridors	
	Fume-generating apparatus at least 20 cm (8 inches) back from face of hood	
	Fans and other equipment capable of creating cross-drafts are kept at a sufficient distance from hood operations	
	Local exhaust units are used where hoods are not suitable or available	
	Air-flow indicator on chemical fume hood appears to be functioning properly	
	Label on chemical fume hood indicates that hood performance has been checked within the last twelve months	
	VAV chemical fume hood/room supply (make-up) air interface appears to be functioning properly	

Safety Equipment		
Status	Criterion	Comment
	Eye wash station available and inspections current	
	Deluge shower available and inspections current	
	Supply of personal protective equipment adequate	

Program Administration		
Status	Criterion	Comment
	Deficiencies noted during last inspection communicated to persons responsible for correction.	
	All activities posing significant safety or health risks are covered by written procedures that have been reviewed with the intent to ensure that they incorporate adequate warnings and specify adequate protective measures.	

<p align="center">APPENDIX B:</p> <p align="center">LISTING OF HAZARDOUS CHEMICALS AND WASTES</p>

Use the table format shown below to list all hazardous chemicals (as defined in ANL ESH Manual Chapter 4-1) that are presently in the LOM laboratory, and hazardous wastes that are likely to be present. Identify each chemical by the same name that is on the label of its container. The office of the XFD ES&H Coordinator provides this listing periodically. Additions may be written in by hand until an updated listing is received.

HAZARDOUS CHEMICALS (AS DEFINED UNDER 29 CFR 1910.1200)

Name of Substance(s) (As identified on container label and MSDS.)	CAS No(s).	Common Synonyms

HAZARDOUS WASTES (AS DEFINED UNDER RCRA)

Name of Substance(s) (As identified on container label and MSDS.)	CAS No(s).	Location of Waste Containers

APPENDIX C: PROCEDURES

Insert copies of all written procedures required by MHATT CAT policy, including (but not limited to) the general procedures for use and testing of equipment in the LOM laboratory and the operation-specific procedures required as the result of the experiment review process. Include waste handling procedures if the laboratory produces hazardous wastes.

Procedures in the Appendix will be easier to find if they are numbered and placed behind correspondingly numbered tabs, with a list of the procedure titles and numbers at the front.

4.12 MHATT CAT GUIDELINE FOR INSPECTIONS

INTRODUCTION

These guidelines are in the form of checklists for:

- Quarterly ES&H inspections by the MHATT CAT Safety Committee
- Monthly shop inspections by the User LOM Shop Safety Coordinator.

For a Monthly Laboratory Inspection Checklist, see *MHATT CAT Guidelines for LOM Laboratory Information Binders*.

MHATT CAT Safety Committee
Quarterly ES&H Inspection Criteria

SECTOR NO. - _____ BEAMLINE NO.- _____ LOM LAB NO.- _____ DATE - _____

SAFETY INSPECTION COMMITTEE CHAIR OR DESIGNEE - _____

Mark each item below as follows:

S (or checkmark) for Satisfactory

R for Requires follow-up (within 10 days)

U for Urgent response needed (within 1 day)

If all items in a category are satisfactory, circle "Satisfactory" in the category heading.

Satisfactory

GENERAL

- _____ Are all exits and aisles unobstructed?
- _____ Are work areas clear and lab benches not overcrowded?
- _____ Do any potential tripping hazards exist?
- _____ Are equipment and materials stored safely?
- _____ Are containers for disposal of broken glass available?
- _____ Are waste containers labeled and in good condition?
- _____ Is glassware stored safely?
- _____ Are file cabinets/shelves secured to wall or tagged as unsecured?
- _____ Are gas cylinders secured properly?
- _____ Are any unusual noises or odors present?
- _____ Is overall housekeeping good?
- _____ Do waste logbooks document monthly inspections of Satellite Accumulation Areas?
- _____ Other: _____

Satisfactory SAFEGUARDS AND SAFE PRACTICES

- _____ Are off-hours instructions for unattended operation posted?
- _____ Is safety handbook available?
- _____ Are protective shields in place if needed?
- _____ Are machine guards in place if needed?
- _____ Are emergency shutdown procedures posted?
- _____ Are emergency shutoffs for house utilities and compressed gases unobstructed?
- _____ Have you observed any unsafe acts or noncompliance with safety rules?
- _____ Are lab doors to corridors closed?
- _____ Does any equipment extend over the boundary lines marked on the floor? (Aisles must be unobstructed.)
- _____ Do any potential overhead hazards exist?
- _____ Is medical look-alike (lab ware) waste can available?
- _____ Is "sharps" disposal container available?
- _____ Do any illumination problems exist?
- _____ Is general ventilation acceptable?
- _____ Are vent purges set properly?
- _____ Is emergency door unobstructed?
- _____ Is emergency door unlocked?
- _____ Other: _____

Satisfactory PROTECTIVE EQUIPMENT

- _____ Is the safety cabinet stocked appropriately with applicable items from the following list?
- | | |
|----------------------|----------------------|
| _____ Safety glasses | _____ Face shields |
| _____ Gloves | _____ Thermal gloves |
| _____ Splash goggles | |
| _____ Other: _____ | |

Satisfactory EMERGENCY EQUIPMENT

- _____ Is access to fire extinguisher unobstructed?
- _____ Is fire extinguisher seal intact?
- _____ Are eye wash stations and safety shower inspected and unobstructed?
- _____ Other: _____

Satisfactory GENERAL LABELING

- _____ Are chemicals properly labeled and tagged?
- _____ Are cylinders properly labeled (tags on nonstock cylinders)?
- _____ If required, are "Hot" signs properly worded and clearly visible?
- _____ If required, are "Radioactive" signs properly worded and clearly visible?
- _____ If required, are "HIGH VOLTAGE" signs properly worded and clearly visible?
- _____ If required, are other signs properly worded and clearly visible?
- _____ If required, are over-temperature alarms installed?
 - On which units? _____
- _____ If required, are other alarms installed?
 - On which units? _____
- _____ Are electrical panels and other electrical shut-off switches properly labeled?
- _____ Other: _____

Satisfactory MECHANICAL

- _____ Are all devices mechanically stable (suitable base for height and weight and anchored to _____ floor, if appropriate)?
- _____ Are there any stored energy hazards?
 - _____ Gravity
 - _____ Spring
 - _____ Vacuum
 - _____ Pressure
 - _____ Other : _____
- _____ If required, are overpressure alarms installed?
 - On which units? _____
- _____ Are equipment/shelves/cabinets secured properly?
- _____ Are cabinet tops free of stored items, as required by APS?
- _____ Are any sharp edges present?
- _____ Are there any unmarked or unprotected protruding objects?
 - _____ Hazard removed
 - _____ Safety guard recommended
 - _____ Other recommendations: _____

Satisfactory ELECTRICAL

- _____ Are power strips secured?
- _____ Are any faulty or frayed wires present?
- _____ Are any electrical boxes open?

_____ Other: _____

Satisfactory FLAMMABLE AND COMBUSTIBLE LIQUIDS

_____ Are all aerosol sprays with flammable propellants stored in
flammable-liquid storage cabinets?

_____ Is the storage cabinet inventory up to date?

_____ Are glass bottles stored in catch pans?

_____ Are electrically conductive containers which are used for
transferring flammable liquids grounded and bonded?

_____ Other: _____

Satisfactory RADIATION PROTECTION SAFEGUARDS

_____ Is beamline shielding in place? (Use separate checklist.)
_____ Are beamline padlocks secured?
_____ Is FOE and Experimental Station shielding in place? (Use
separate checklist.)
_____ Are FOE and Experimental Station interlocks undisturbed, per
visual inspection?
_____ Are FOE and Experimental Station emergency beam dump
buttons unobstructed?
_____ Has a beamline radiation survey been done within the past
month?
_____ Other: _____

ADDITIONAL COMMENTS:

SHOP INSPECTION CHECKLIST

The following items will be checked each month by the Shop Safety Coordinator, who will ensure that all observed deficiencies are corrected and will file this checklist with the secretaries of the CATs that occupy LOM 432.

S (or checkmark) for Satisfactory

R for Requires follow-up (within 10 days)

U for Urgent response needed (within 1 day)

	"Safety Glasses Required" signs are posted at all entrances
	Supply of visitors' safety glasses is adequate
	List of approved machine operators is displayed
	Machine guards are in place
	Belts are in good condition
	Safety shields are in place
	Safety shield windows are clean and clear
	Machines are free of debris
	Power switches are unobstructed
	Unobstructed access to emergency power disconnects
	Machines have adequate working area and room to allow operator to step back in an emergency
	Clamping mechanisms are in good operating condition
	All special tools for machine operation are properly stored at machine
	Machines are operating within manufacturers' safety specifications
	Aisles to exit doors are unobstructed
	No tripping hazards are present
	Power cords are properly secured
	Intact insulation on power cords
	Lighting is adequate
	Machines are anchored to floor
	Neat and orderly shop (general housekeeping)

4.13 MHATT CAT GUIDELINE FOR ACCIDENT INVESTIGATIONS

INTRODUCTION

Purpose

The primary purpose of an incident or accident investigation is to identify the hazard control systems that either failed or were lacking. By determining the direct, contributing, and root causes, MHATT CAT hopes to identify corrective actions that can help prevent similar occurrences.

Applicability & Scope

This guideline applies to incidents and accidents occurring in MHATT CAT's facilities at the APS.

DEFINITIONS

- **Accident:** an unexpected event that produces personal injury, illness, or death; damage to or loss of property or vehicles; or environmental releases involving reportable quantities of radiation or hazardous materials.
- **Incident:** an unexpected occurrence that could result in an accident or illness if repeated—a “near miss.”
- **First aid:** one-time treatment and subsequent observation of minor scratches, cuts, splinters, burns, etc., that do not ordinarily require medical care from a physician. (Such treatment is considered first aid even if it is provided by medical personnel.)
- **Occupational illness:** an abnormal physical condition or disorder caused by exposure to chemicals, radiation, or any other factors associated with the work environment.
- **Reportable accident:** any accident whose consequences go beyond the administration of first aid.

RESPONSIBILITIES

Director

The MHATT CAT Director shall ensure that the requirements of this guideline are met. The Director shall also review all investigation reports.

First-Line Supervisors

First-line supervisors and Principal Investigators with direct responsibility for the people, equipment, or facility involved in an incident or accident shall ensure that the MHATT CAT Safety Coordinator and MHATT CAT Sector Manager are promptly notified and shall perform the initial investigations. Supervisors are also responsible for ensuring that appropriate corrective actions are implemented.

MHATT CAT Sector Manager

The MHATT CAT Sector Manager shall:

- Investigate incidents and accidents (unless the MHATT CAT Director assigns another individual to this role) and support the investigatory efforts of other MHATT CAT personnel;
- Promptly notify the XFD ES&H Coordinator of any occupational illness or reportable accident; and
- Monitor the progress of corrective actions and advise managers when schedules are not being met.

All MHATT CAT Personnel

MHATT CAT personnel shall immediately report all injuries and illnesses through the 911 system either by calling 911 or by having a co-worker call. MHATT CAT personnel shall also report accidents and incidents to MHATT CAT line management as described below. MHATT CAT personnel, including witnesses to an incident/accident, are expected to participate in investigations as required.

RESPONSE TO ACCIDENTS AND INCIDENTS

Notification

Any person who witnesses an accident or incident or who comes upon an accident or incident not known to be previously reported shall first call 911 if appropriate and then immediately notify the MHATT CAT Sector Manager. If he/she is unavailable, notify the APS Floor Coordinator. All phone calls should be made from a safe location.

The MHATT CAT Sector Manager or an alternate shall notify the XFD ES&H Coordinator as soon as is practical after learning of any occupational illness or reportable accident, for further guidance on investigation and reporting requirements.

On-Scene Actions

Upon arriving at the scene of a reportable accident, MHATT CAT personnel shall report to the Area Emergency Supervisor, if present, and secure the area and all related equipment and machinery to prevent further incidents and preserve evidence that may be relevant to subsequent investigations. MHATT CAT should notify either the XFD ES&H Coordinator or the APS Floor Coordinator if additional assistance is needed in securing the incident/accident scene.

Investigation of incidents and first-aid accidents

The MHATT CAT Sector Manager (or alternate appointed by the MHATT CAT Director) will lead investigations of incidents and first-aid accidents. Reports shall be submitted to the MHATT CAT Director for review and concurrence.

Investigation of occupational illnesses and reportable accidents

The MHATT CAT Sector Manager will seek guidance from the XFD ES&H Coordinator upon learning of any occurrence in these categories.

REFERENCES

- The Code of Federal Regulations, Title 29, Part 1904
- Chapter 1-7 of the *ANL ESH Manual*

4.14 MHATT CAT GUIDELINE FOR LOM SHOP USAGE

INTRODUCTION

Purpose

This guide is intended to reduce the risk of personal injury, environmental insult, and damage to equipment by identifying how the CAT will manage hazards posed by machine tool usage. Adherence to these guidelines will also result in compliance with APS requirements found in the ANL *ES&H Manual*.

Applicability & Scope

These guidelines describe how the CAT will ensure that 1) LOM shop machine tools are in compliance with safety requirements and 2) their usage is restricted to trained persons. They apply to all machine tool usage by MHATT CAT personnel.

DEFINITIONS

- **Authorized Operator:** A CAT member who has been approved by the Shop Safety Coordinator (or alternate) to use a machine tool(s) at the APS. To earn approval, a candidate must first satisfy the Shop Safety Coordinator that he or she can use the tool properly (including safely) and be given an orientation by the MHATT CAT.
- **MHATT CAT Personnel:** MHATT CAT members, collaborators, Independent Investigators working in the MHATT CAT's sector, and contractor personnel working for the MHATT CAT.
- **Machine Tools:** Material forming tools designed to be stationary (as opposed to hand-held) while being operated.

RESPONSIBILITIES

MHATT CAT Personnel

MHATT CAT personnel shall obtain required MHATT CAT authorization before using machine tools. They shall also report any unsafe condition to the Shop Safety Coordinator as soon as it comes to their attention. Machine operators will inspect machine tools before each use of the tool to verify that the tool appears to have required guarding and is operating properly.

Shop Safety Coordinator

The MHATT CAT Shop Safety Coordinator or the MHATT CAT Sector Manager shall:

- Notify the Floor Coordinator, in advance of installation, about machine tools (and other equipment and furnishings) the CAT proposes to add to the LOM shop or to use elsewhere at the APS;

- Arrange for a shop inspection by the XFD ES&H Coordinator (or his designee) prior to putting the shop into service;
- Arrange for an inspection, by the XFD ES&H Coordinator (or his designee), of each new machine to be added to the shop;
- Conduct monthly machine shop inspections using the Machine Shop Inspection Checklist found at the end of this set of guidelines; and
- Provide candidates for machine tool authorization with an orientation to available machine tools.

MACHINE TOOLS

Pre-Purchase Reviews for CAT-Owned Items

The MHATT CAT will attempt to ensure that all OSHA or ANSI standards are met when CAT-owned machine tools are installed. To do this, the MHATT CAT Shop Safety Coordinator will review purchase orders for new machine tools to ensure that required safeguards are specified. The Shop Safety Coordinator will also inspect equipment transferred from other locations for proper safeguards. In instances where the Shop Safety Coordinator is uncertain about such requirements, the Shop Safety Coordinator will seek guidance from the APS (by notifying the Sector's Floor Coordinator). Before any MHATT CAT-owned equipment is put into service, the MHATT CAT will provide the APS with an opportunity to inspect the machine to verify conformance with applicable standards. (The inspection will be arranged through the Floor Coordinator.)

The Shop Safety Coordinator will ensure that, with the purchase of each new piece of equipment, appropriate criteria are added to the monthly inspection checklist described below. As needed, the CAT will make use of expertise available through the APS to ensure that appropriate criteria are added.

APS-Owned Equipment

The MHATT CAT will rely on the APS to ensure that APS-owned equipment is provided with required safeguards.

Daily Inspections

As appropriate to individual machines, the Shop Safety Coordinator will ensure that a description of the guarding is attached to or posted near each machine tool. Before each use of the machine, the user will ensure that the guarding is in place.

Monthly Inspections

The Shop Safety Coordinator will conduct monthly machine shop and machine tool inspections using a checklist that incorporates machine guarding criteria. A copy of the checklist follows.

Deficiencies

The Shop Safety Coordinator will lock out machine tools having deficiencies and will not return them to service until the problems have been corrected.

AUTHORIZATION OF PERSONNEL

List of Authorized Operators

Only CAT-authorized individuals may use LOM shop machine tools at the APS. The MHATT CAT will maintain a list of the names of all such MHATT CAT personnel and the machines they have been authorized to use. The list will be posted in conspicuous locations, including on the outside of the LOM Machine Shop door, and will also be listed in the *MHATT CAT Environmental, Safety, & Health Plan*.

To earn authorization to use a machine tool, individuals must be able to demonstrate an ability to use the tool properly (including safely). The judgment regarding whether a person possesses the experience to safely operate shop machinery will be left up to the Shop Safety Coordinator.

MHATT CAT management believes it will be impossible to provide in-depth training to every person that might want to use the shop. Consequently, most persons wishing to use the shop will have to come to the APS facility with appropriate skills or will have to have the machining done for them by others. The MHATT CAT will, however, provide experienced equipment users with an orientation to the shop and a copy of the general shop rules (see below).

Orientation

The MHATT CAT will provide candidates judged to have appropriate machine usage skills with an orientation to the LOM Machine Shop and/or CAT-owned machine tools not located in the shop. A checklist reflecting the content of the orientation appears below. A copy of the orientation handout also follows.

Loss of Authorization

The MHATT CAT Director, Sector Manager, or Shop Safety Coordinator may suspend or revoke any person's authorization to use the machine shop or machine tools for cause. Defeating or circumventing installed guarding is, by itself, sufficient cause for revocation of a person's authorization.

If a person's authorization is revoked, the person's name will be removed from the list of authorized personnel. Personnel who use the shop after losing their authorization may lose research privileges at the APS.

REFERENCES

- The Code of Federal Regulations, Title 29, Part 1910
- Chapter 7-15 of the *ANL ESH Manual*

LOM MACHINE SHOP ORIENTATION RECORD

Instructor	Date:	
Attendees:		

- ___ Provide each attendee a copy of the **LOM Machine Shop Orientation** handout.
- ___ Describe the process for becoming an Authorized Operator.
- ___ Discuss each point listed in the "General Shop Rules" section of the **LOM Machine Shop Orientation** booklet and answer all questions. Point out where the "General Shop Rules" are posted.
- ___ Inform attendees that nonconformance to any of the General Shop Rules or deviation from instructions provided during the orientation is sufficient cause to revoke shop use privileges.
- ___ Emphasize the requirement to maintain a neat and orderly shop and instruct attendees to avoid actions that would create tripping hazards.
- ___ Instruct attendees not to place equipment or materials in demarcated work areas and aisles and to maintain a clear route of egress at all times.
- ___ Re-emphasize that Authorized Operators may not remove guards, but rather should report to the Shop Safety Coordinator or Floor Coordinator those instances where a guard interferes with work. Explain that the person to whom the problem is reported will attempt to resolve the problem.
- ___ Inform attendees that all machine maintenance must be arranged through the Floor Coordinator.
- ___ Show attendees a lockout tag and instruct them how to comply with lockout/tagout requirements. (Authorized Operators will not normally engage in shop activities that require lockout and tagout. When they do, they must inform the Shop Coordinator.)
- ___ Instruct attendees about the proper use of the various waste receptacles and where to dispose of different types of metal chips, oily rags, other dirty rags and other wastes.
- ___ Point out the locations of the emergency power cutoff for each machine.

- ___ Instruct attendees how to use shields to avoid getting fluids on the floor. Show the attendees the location of the spill control absorbent and instruct them to immediately clean up spills.
- ___ Point out the location of relevant machine controls. If appropriate, use a supplementary machine orientation checklist.
- ___ As applicable, show location of and review use of daily checklist.

GENERAL SHOP RULES

- Do not engage in horseplay.
- Immediately report all malfunctions and deficiencies to your CAT Shop Safety Coordinator.
- Wear ANSI-approved safety eyewear with side shields whenever in the shop.
- Do not leave the work area without completing cleanup.
- Never leave machines running unattended.
- Use only brushes, vacuum tools, or other special tools to clean debris from pieces. Never use your hands to brush away chips and NEVER USE COMPRESSED AIR TO BLOW CHIPS AND DUST FROM WORK.
- Use tongs or other remote handling tools to keep hands away from pinch points and moving parts.
- As appropriate, use vises and clamps to hold work.
- Do not manually adjust and gauge (caliper) work while the machine is running.
- Never wear jewelry or loose fitting clothing while operating machines. Remove neckties, tuck in shirt tails, and securely roll up sleeves.
- Sturdy leather shoes (safety shoes preferred) are required. Athletic shoes, sandals, etc., do not satisfy this requirement.
- Cover long hair that could get caught in moving parts.
- Use the correct tool for the job. If the correct tool is not available, inform your CAT Shop Safety Coordinator.

- Contact a Shop Safety Coordinator or Floor Coordinator if you need to have a grinding wheel installed or replaced.
- Do not remove or circumvent any machine guarding.

LOM Machine Shop Orientation

This orientation is intended for experienced machine operators. By itself, it will not provide the knowledge and experience required to use machine tools properly.

1. Authorization of Personnel

Injuries on machine tools are most often caused by unsafe work practices or incorrect procedures. Poor training and inadequate supervision are often contributing causes. Proper safeguarding on machines, good housekeeping in the work area, and good work habits help to reduce injuries and accidents.

To earn authorization to use a machine tool, you must be able to demonstrate to the Shop Coordinator your ability to use the tool properly (including safely). The judgment regarding whether you possess the experience to safely operate shop machinery will be left up to the Shop Safety Coordinator.

After you have demonstrated to the Shop Safety Coordinator that you can use the machine and completed this orientation, your name will be added to the list of authorized personnel and you will be considered an authorized machine tool operator.

2. APS General Shop Rules

You must adhere to the following general shop rules to maintain your authorization. These rules are posted in the LOM Machine Shop.

- Do not engage in horseplay.
- Immediately report all malfunctions and deficiencies to your CAT Shop Safety Coordinator.
- Wear ANSI-approved safety eyewear with side shields whenever in the shop.
- Do not leave the work area without completing cleanup.
- Never leave machines running unattended.
- Use only brushes, vacuum tools, or other special tools to clean debris from pieces. Never use your hands to brush away chips and NEVER USE COMPRESSED AIR TO BLOW CHIPS AND DUST FROM WORK.
- Use tongs or other remote handling tools to keep hands away from pinch points and moving parts.

- As appropriate, use vises and clamps to hold work.
- Do not manually adjust and gauge (caliper) work while the machine is running.
- Never wear jewelry or loose fitting clothing while operating machines. Remove neckties, tuck in shirt tails, and securely roll up sleeves.
- Sturdy leather shoes (safety shoes preferred) are required. Athletic shoes, sandals, etc., do not satisfy this requirement.
- Cover long hair that could get caught in moving parts.
- Use the correct tool for the job. If the correct tool is not available, inform your CAT Shop Safety Coordinator.
- Contact a Shop Safety Coordinator or Floor Coordinator if you need to have a grinding wheel installed or replaced.
- Do not remove or circumvent any machine guarding.

3. Housekeeping

As an Authorized Operator, you are responsible for maintaining the area in a neat and orderly fashion while working in the Machine Shop. Plan and conduct your work in a manner that does not create tripping hazards and complete your cleanup before you leave the shop.

4. Demarcated Areas

Keep demarcated work areas and aisles free of equipment and materials. Maintain clear routes of egress at all times.

5. Machine Guarding

You may not remove machine guards. If a guard interferes with your work, report the problem to the Shop Safety Coordinator or Floor Coordinator. One of them will attempt to resolve the problem.

6. Lockout/Tagout

Notify your Shop Safety Coordinator if you feel you need to engage in shop activities that require lockout and tagout. Do not lock out equipment without immediately notifying the Shop Safety Coordinator.

7. Waste

Dispose of wastes, such as metal chips, oily rags, and other dirty rags, in containers provided for this purpose to prevent accumulation. Use brushes to brush off chips and shavings from machines; do not use your hands or an air hose.

8. Emergency Power Cutoff

You must know the location of the emergency power cutoff prior to operating any power equipment and must have ready access to this switch during operation.

9. Spill Control

Shields or splash guards will be used on machines where cutting oils or coolants are used. Floors around machinery should be kept dry and clear of refuse to minimize the danger of slipping. Use the spill control absorbent immediately to control spills and leakage and then clean it up.

10. Machine Controls

You must be aware of the various machine controls (start button, stop button, speed change control) for each machine you are authorized to operate. These controls must be unobstructed at all times.

Monthly LOM Machine Shop Inspection Record

Date of Inspection:	Name of Inspector:	Date of Next Scheduled Inspection:
---------------------	--------------------	------------------------------------

General Inspection Criteria	Status	Comments/ Action Required
All deficiencies identified during last inspection corrected?	Y N	
Adequate supply of visitors' safety glasses	Y N	
"Usage of Shop Limited to Authorized Personnel" & "Safety Glasses Required" postings in place on outside of shop door	Y N	
Lists of Authorized Machine Operators and Daily Inspection Checklists posted and current	Y N	
Overhead and task lamps working properly	Y N	
Work table clean and vise(s) working properly	Y N	
Stationary machines anchored to the floor	Y N	
Access to emergency power disconnects free of obstructions	Y N	
Protection against automatic machine restart working properly	Y N	
Demarcated floor areas visible and free of obstructions	Y N	
Working areas for machines free of obstructions	Y N	
General housekeeping adequate	Y N	
Spill control kit (absorbent) in place	Y N	
Waste lead container in place and properly labeled	Y N	
Oily rag waste container in place and properly labeled	Y N	

Vacuum cleaner in place and functioning properly	Y N	
--	--------	--

Belt Sander Inspection Criteria	Status	Comments/Action Required
Guards for in-going nip points in place	Y N	
Belt in good condition	Y N	

(Continued)

Drill Press Inspection Criteria	Status	Comments/Action Required
Power transmission belt & pulley guarding in place	Y N	
Belt & pulley guard interlock working properly	Y N	
Transparent drill shield on "arm" in place	Y N	
Appropriate drill bits properly stored and in good condition	Y N	
Clamping devices in place or properly stored	Y N	
Brush and dust pan available	Y N	

Pedestal Grinder/Brush Inspection Criteria	Status	Comments/Action Required
Power cord in good condition	Y N	
Wheel and spindle end nut guarding in place	Y N	
Work rests adjusted to within 1/8" of wheel	Y N	
Tongue guards adjusted to within 1/4" of wheel	Y N	
Wheel face evenly dressed	Y N	
Power transmission guarding in place	Y N	
Wheel speed rating (rpm) machine speed	Y N	
Transparent shields clean and in place	Y N	
Vibration free running	Y N	

Engine Lathe Inspection Criteria	Status	Comments/Action Required
Chip breaker in place and secure	Y N	
Chuck enclosures in place and functioning smoothly	Y N	
Splash shields and pans in place	Y N	

Cutting bits properly stored and in good condition	Y	N	
Transparent lathe shields clean and functioning smoothly	Y	N	

Items to be removed from service until repaired:

MHATT CAT User Shop Authorized Users

List all Authorized Users, including their badge number who have received training in the use of the LOM User Shop and which Shop Instruments they have been authorized to operate.

Name	Authorized Shop Instrumentation					
	Drill Press	Lathe	Grinder	Sander	Crystal Slicer	Mill
Dohn Arms	Yes	Yes	Yes	Yes	No	No
Sean Corcoran	Yes	Yes	Yes	Yes	No	Yes
Eric Dufresne	Yes	Yes	Yes	Yes	No	No
Walter Lowe	Yes	Yes	Yes	Yes	No	Yes
Bob MacHarrie	Yes	Yes	Yes	Yes	No	No
Tim Nurushev	Yes	Yes	Yes	Yes	No	No
David Reis	Yes	Yes	Yes	Yes	No	No
David Schaefer	Yes	Yes	Yes	Yes	No	Yes

4.15 MHATT CAT GUIDELINE FOR LASER CONTROLLED AREA, 7-ID-D

INTRODUCTION

The laser controlled area (LCA) covered in this document consists of hutch 7-ID-D at the Advanced Photon Source. The room contains a Class IV Ti:Sapphire laser system.

Authorized Users

No person is allowed to operate the laser system in the LCA unless all three of the following requirements are met:

1. Permission from the MHATT CAT Laser Safety Coordinator;
2. Completion of the laser user eye examination approved by ESH Medical Department and the Laser Safety Training;
3. Completion of appropriate safety training from APS and MHATT-CAT, as well as an approval from the APS User's Office to have an access to the experimental floor.

The names of authorized personnel will be posted at the LCA and listed in the *MHATT CAT Environmental, Safety, and Health Plan* at the end of this guideline.

Scientific Collaborators

A Scientific Collaborator is allowed in the LCA for scientific work or laser alignment only if approved by the Laser Safety Coordinator and the above conditions are met. Everybody in the LCA needs to wear proper eyewear approved by the Laser Safety Coordinator when the laser beams are accessible.

Spectators are only allowed to enter the LCA in the presence of authorized personnel if the laser is off or the laser shutters are closed and no laser light is accessible.

Both scientific collaborators and spectators require film badges issued by the APS.

DESCRIPTION AND NORMAL LASER OPERATION

System Description:

The laser system inside the LCA consists of four parts as described in Table 1.: A Ti:Sapphire oscillator (2) pumped by a frequency doubled Nd:YVO laser (1), plus a Ti:Sapphire amplifier (4), pumped by a frequency doubled Nd:YLF laser (3). Not all parts individually constitute independent lasers, however the combined system constitutes a Class IV laser. Its output is the output of the amplifier described in item 4 below; all other beams described below are internal to the combined system and are not accessible during normal operation of the system.

The laser system can be on, shuttered, or off. In the on state, laser beams are accessible and only authorized personnel is allowed in the room. In the shuttered state, the laser is powered on, but physically prevented from emitting light; all

laser light is physically contained inside the system and cannot be accessed. In the off state, the laser power is off and no laser light is produced.

Table 1.: Laser Inventory

<p>1. CW Diode Pumped Nd:YVO Laser ANL ESH IHID # <u>10395</u> Serial # <u>V5-A6795</u> Manufacturer: Coherent Model: Verdi Output: 532nm, CW Beam diameter: 2.25mm TEM₀₀ Beam divergence: 0.5mrad Average power: 5W</p>
<p>2. Ti:Sapphire Oscillator ANL ESH IHID # <u>10396</u> Serial # <u>063</u> Manufacturer: K&M Labs Model: short pulse oscillator Output: 750-850nm, pulsed (repetition rate 88 MHz) Pulse width (FWHM): 20fs Beam diameter: 0.8mm Beam divergence: 1 mrad Average power: <500mW pulsed, <1.5W in CW mode</p>
<p>3. Q-switched Nd:YLF LASER ANL ESH IHID # <u>10397</u> Serial # <u>268</u> Manufacturer: Quantronix Model: 527 YLF Laser Output: 527nm and 1054nm, pulsed (repetition rate 1-10kHz) Pulse width (FWHM): 200ns Beam diameter: 2mm (multimode) Beam divergence: 5 mrad Average power: 20W at 527nm, less than 500mW residual at 1054nm</p>
<p>4. Ti:Sapphire Amplifier ANL ESH IHID # <u>10398</u> Serial # <u>029</u> Manufacturer: Quantronix Model: Odin Amplifier Output: 750-850nm, pulsed (repetition rate determined by item 3: 1-10kHz) Pulse width (FWHM): 45 - 80fs Beam diameter: 3mm (near-TEM₀₀) Beam divergence: < 100μrad Average power: 1W</p>

Note: The oscillator (item 2) and amplifier (item 4) do not produce any output radiation if their respective pump lasers (item 1 and 3 resp.) are shuttered or not in operation.

The overall system diagram is shown in Figure 1. The output of item 1 is used to pump the oscillator item 2 directly, the output of Item 3 will be used to pump item 4 directly. Item 2 provides a seed pulse to Item 4 for amplification. All of these beams will be enclosed and shielded where practical and will not be accessible or be manipulated during normal operation. Item 4 will produce an amplified output beam for use, which is the only accessible beam during normal operation.

Eyewear:

The eyewear worn for standard laser operation should provide an optical density (OD) of at least 4 at wavelengths of 750-850nm for protection against the Ti:Sapphire beams. The eyewear for alignment of the laser which exposes the pump beams should additionally provide OD \geq 4 at 514-532nm and 1054-1064nm, for protection against the green and residual IR laser beams from the Neodymium pump lasers.

Standard protective laser eyewear will be provided at the entrance to the hutch 7-ID-D. (The eyewear provided for Ti:Sapphire has OD \geq 7 at 695-1200nm. The eyewear provided for Neodymium wavelengths has OD \geq 6 at 514-532nm and 1054-1064nm.)

All laser protective eyewear will be inspected quarterly and the results will be recorded in a log sheet attached at the end of this Guideline.

Laser Hazards:

The Class IV lasers in 7-ID-D produce visible (green) and invisible radiation (infrared around 800nm) with sufficient power or energy to cause retinal or other injury to the eye, in both direct or specularly reflected beams. Diffuse reflections of the beam can be hazardous. The lasers also have the potential to cause burns on the skin or ignite flammable material.

Other hazards:

High voltage:

208VAC, 3 phase with ground, 30Amp/phase (power line to item 3).

110VAC, single phase, 100W (power to items 1,2,4).

METHODS TO CONTROL HAZARDS ASSOCIATED WITH OPERATION OF THE LASER

The procedures for alignment of the laser subsystems are documented in the manuals for the K&M Labs Ti:Sapphire oscillator and the Quantronix Odin amplifier. During normal operation, Ti:Sapphire laser goggles must be worn; during laser alignment involving exposure of the pump laser beams, additional goggles for Neodymium laser protection must be worn (see eyewear section above). IR viewers and IR viewing cards will be provided to view the laser beams while wearing eye protection. The beam path will be confined to a plane below the eye level for operators in a standing position.

An additional light shield will be installed towards the entrance of the laser enclosure. The laser eyewear will be inspected quarterly and the results of the inspection will be recorded in the table attached at the end of this document.

Additional control of laser hazards

1. *LASER HAZARD WARNING SIGNS* are posted above the entrance door to the 7-ID-D and will be illuminated when the laser is on.
2. An *INTERLOCK SYSTEM* is installed at the entrance doors to the LCA, which automatically closes an internal shutter of the laser system upon an entry to the LCA by unauthorized personnel. A timed defeat switch is installed at the entrance for the authorized operators to exit/enter the LCA without interrupting laser experiments. Figure 2 shows the location of the interlocks and Figure 3 shows a summary of the interlock actions.
3. The interlock system will be inspected quarterly per the actions in Figure 3, and the results will be recorded in the log sheet attached at the end of this document. The door switch in 7-ID-D will be inspected to see if they fulfill the expected function.
4. *LASER SAFETY GLASSES* or other eye protection devices which provide sufficient attenuation of hazardous light intensities to prevent eye injury to the wearer shall be worn whenever such hazardous light intensities are present. Laser safety glasses will be provided at the entrance to the LCA. They will be inspected quarterly and the results will be recorded in the log sheet attached at the end of this document.
5. *LASER BEAM SHIELDS* are made of non-combustible laser beam stops, which will not create hazardous light airborne particulate matter when in use. The beam path is confined to a plane well below eye level and shielded as much as practicable. In addition, the laser table is shielded with nylon curtains which protect personnel inside the LCA during normal operation. It should be noted that while these curtains protect against the infra-red lasers and diffuse reflections and some specular reflections of the pump laser, they do not protect against the direct 527 nm pump laser. However, the material will simply burn through without igniting such that it is not a fire or smoke hazard in the unlikely event it is hit with the direct 527 nm pump. An interlocked curtain at the entrance to the LCA will protect against all laser radiation.
6. *UNAUTHORIZED OPERATION* The Laser Power Supply Keys for the class IV laser will be switched to the disabled state while the laser is off and unattended, and the power supply circuit breaker will be shut off. The master interlock shutter control key will be switched off in the disabled state. The keys will remain in a "lock box" while the laser is not in operation to prevent unauthorized operation of the laser.
7. *EMERGENCY LASER CUT-OFF SWITCH (Class 4)* Two panic switches are marked by large signs in red. These switches insert all laser shutters and turn off the arc lamps to the Nd:YLF laser (item 3).

Standard Operation Procedures for Handling Postulated and Credible Abnormal and Emergency Conditions

In the events of:

1. Breakdown of a high voltage system Call 911 if help is needed, shut off power at main circuit breaker, and report to the Laser Safety Coordinator.
2. Laser burns to eyes and/or skin Call 911, shut laser system down, report to Laser Safety Coordinator, the Sector Manager, and to the APS floor coordinator.
3. Laser coolant (water) accidentally discharged into the environment Shut laser system down, report to the Laser Safety Coordinator, and report to the APS floor coordinator to have the discharge cleaned up.
4. Fire and tornado In case of fire, call 911, quickly evacuate from the LCA and pull the nearest fire alarm. In case of tornado, evacuate immediately to the nearest tornado shelter (the restrooms at Building 433).

Methods to Control Hazards Associated with Alignment of the Laser and the Laser Beam it Produces

During alignment of the laser in 7-ID-D, or operation which requires the presence of an operator, the automatic door to the hutch is kept open. Laser shielding (a curtain for shielding the laser beam) and a barrier sensor are installed at the 7-ID-D automatic door entrance which will not hinder the entry/exit for the operators. Other unauthorized personnel are not allowed to enter 7-ID-D during operation of the laser and are warned by the laser warning lights above the hutch door and a warning sign on the laser curtain. If the barrier sensor is blocked due to an entry through the curtain or the curtain is not closed in place, the laser shutters inside 7-ID-D will close, stopping any laser beam. Once inside the curtain, the authorized laser operator will be able to reopen the shutter by activating the laser shutter switch inside 7-ID-D. Light shielding is provided along the laser beam path inside 7-ID-D as much as possible.

Appropriate laser goggles must be worn in 7-ID-D at any time exposure to the laser beam is possible.

Alignment of the laser components will be performed with all beams turned to the minimum power necessary for the procedure. After alignment, all laser beams between laser components will be shielded from view and access by beam tubes and permanent shields as much as possible. Laser beam shields along the path of the output beam from the final amplifier will be installed where possible to minimize the possibility of laser beam exposure.

LASER TABLE LAYOUT

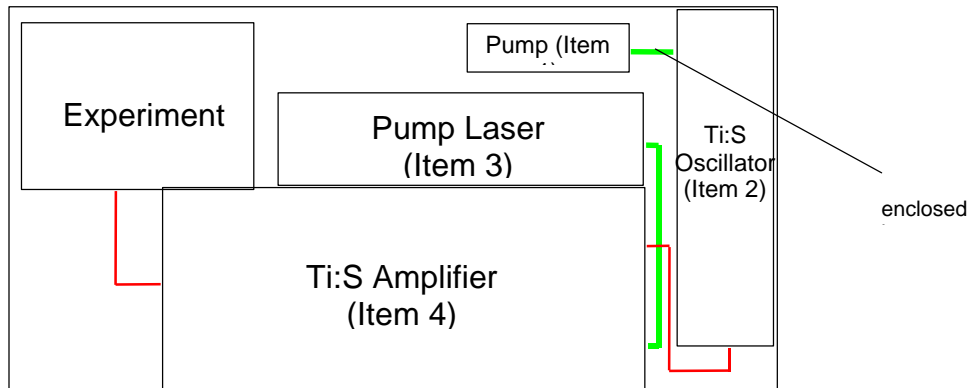


Figure 1

Floor Plan

Title:
hutch11.eps
Creator:
fig2dev Version 3.2 Patchlevel 0-beta3
Preview:
This EPS picture was not saved
with a preview included in it.
Comment:
This EPS picture will print to a
PostScript printer, but not to
other types of printers.

Figure 2

LCA INTERLOCK SYSTEM

Interlock State	Emergency Laser Shutoff	Master Key	Back Door	Entry Curtain	Entry Sensor *	Lid	State Request		
							1	2	3
3 Danger: Beams Accessible	1	2	1	1	2	—	1	2	—
2 Warning: Laser Energized	1	—	1	1	1/—†	1	1	—	3§
1 No Hazard: laser off	—	—	—	—	—	—	—	2§	—

In state **3**., all shutters and the Nd:YLF lamps are enabled.
 In state **2**., only the Verdi shutter and the Nd:YLF arc lamps are enabled—all laser light is contained.
 In state **1**., all shutters and the Nd:YLF lamps are disabled.

* The action of the entry sensor may be temporarily overridden by the timed bypass switch.
 † System drops to state 1 if the Master Key is out, otherwise no action is taken.
 § Master Key is required to raise state.

In addition, all action that takes the system from state **3** to state **2** requires that the conditions for state 2 are met, otherwise the system will drop to state **1**.

Figure 3

Authorized Users

List all Authorized Users, include their badge number. Users should sign the document to verify that they have read and understand the Guidelines for the Laser Controlled Area, 7-ID-D.

NAME (printed)	BADGE	SIGNATURE
DAVID REIS	86798A	
MATT DeCAMP	86711A	
MARCUS HERTLEIN		
PHIL BUCKSBAUM	86712A	
ERIC DUFRESNE	85323A	
ERNEST WILLIAMS	85189A	
ROY CLARKE		

Laser Eye Wear Inspection Log:

Date of Inspection

Results

Inspector

[illegible]

Laser Interlock Inspection Log for 7-ID-D

Date

Result

Inspector

4.16 MHATT CAT GUIDELINE FOR EXPERIMENT SAFETY REVIEW

INTRODUCTION

This guideline describes how the MHATT CAT will ensure that the experiments conducted at its beamlines and in its LOM space by MHATT CAT personnel, their collaborators, and independent investigators do not present unacceptable risk.

This experiment safety review process is an example of how MHATT CAT has integrated safety into the way it manages its activities at the Advanced Photon Source. The process addresses the core functions of the Integrated Safety Management (ISM) system required at Argonne National Laboratory. In the context of experiment safety review, those functions can be described as:

1. Defining planned experiments,
2. Identifying and analyzing hazards associated with planned experiments,
3. Defining safety envelopes by selecting, specifying, and authorizing required hazard controls,
4. Performing experiments within the defined bounds of safety envelopes, and
5. Evaluating the safety performance of completed experiments to provide continuous feedback for improving safety.

The MHATT CAT will use the APS Experiment Safety Approval Form (ESAF) to document the experiment safety reviews it conducts. An ESAF is attached to this guideline.

The MHATT CAT management assumes full responsibility for all the program elements listed above, including the maintenance of auditable records of the process. The MHATT CAT management will make records available to personnel engaged in the Independent CAT Safety Assessment process established and overseen by the APS, to representatives of the APS, and to other ANL and DOE personnel that are required to have access. Moreover, before adding to or changing the safety envelopes described in this plan, MHATT CAT management will seek assistance from qualified safety personnel from the APS and ANL.

DEFINITIONS

The following definitions are derived from the *ANL Environment, Safety and Health Manual* chapter covering experiment safety review:

Experiment. Preparatory non-office activities including the transportation of hazardous materials, experimental activities taking place on the beamline, and subsequent non-office activities taking place at the APS.

Hazard: Any existing or potential¹ condition that, by itself or through interaction with other conditions, has the capacity to cause death, injury, illness, property

¹The determination of "potential" to cause harm shall be made without considering probability or risk reduction attributable to hazard mitigation measures.

damage, unacceptable environmental impact, or other losses. In this context, a "condition" means the presence of a material, a piece of equipment or an instrument, an energy source, or an operation. Also see *risk*.

Risk: A quantitative measure (or estimate) of the product of the probability that a hazard will result in an ill effect and the consequence of that ill effect. (Risk is a measure of the significance of a hazard and an indicator of the need for hazard controls.)

Biohazard: An agent of biological origin that has the capacity to cause deleterious effects in humans. The term includes, but is not necessarily limited to, all infectious microorganisms, their toxins, allergens of biological origin, and genetic fragments.

Flammable: Susceptible to ignition during storage, normal handling or use. (Whether something is flammable has nothing to do with the likelihood that it will ignite. For example, the release of a small quantity of a flammable gas might not result in a gas concentration between the lower and upper flammability limits, but the material would still be considered flammable.) The term includes, but is not necessarily limited to:

- All materials that ignite spontaneously when exposed to air,
- All gases easily ignited in atmospheres containing approximately 21% oxygen,
- All liquids having a flashpoint below 100°F (38°C), and
- All combustible solids and liquids having a physical form that makes them easily ignitable if dispersed into ambient atmospheres.

Radioactive: Having a measurable specific activity above background.

Toxic: Having the capacity to cause illness or diminished function. (The determination that something is toxic is made without regard to the likelihood that it will actually produce an ill effect. For example, a small quantity of a toxic material might be thought less than the minimum dose needed to cause a toxic effect, but the material would still be considered toxic.) A material that meets one or more of the following criteria should be considered toxic:

- Has a published LD₅₀ (median lethal dose) equal to or less than 0.5 g/kg body weight.
- Has a published LC₅₀ (median lethal concentration) equal to or less than 1000 ppm.
- Has an OSHA permissible exposure limit (PEL) or ACGIH TLV (Threshold Limit Value) equal to or less than 5000 ppm.
- Has an OSHA PEL or ACGIH TLV equal to or less than 10 mg/m³.

GENERAL SAFETY ENVELOPE

All MHATT CAT activities will be conducted within an envelope of safety created by engineered hazard controls, formal procedures, training, policy, reviews,

authorizations and approvals. The general safety envelope at the APS has been defined by:

1. The User Orientation (provided by the APS)
2. The MHATT CAT sector-specific orientation (administered by MHATT CAT)
3. The APS Beamline Design Review Process (conducted by the APS)
4. The MHATT CAT Management Plan (approved by the APS), including the MHATT CAT Safety Plan (which is consistent with the ANL *Environment, Safety and Health Manual*)
5. The APS Beamline Commissioning Process (conducted by the APS and MHATT CAT)

This MHATT CAT experiment review process provides for establishment of safeguards needed to accommodate experiments with hazards not adequately controlled by the processes, policies, and procedures defining the general safety envelope.

CAT EXPERIMENT APPROVAL AUTHORITY

As stated in Section 2.1 of this document, the MHATT CAT Safety Committee will conduct experiment safety reviews and grant approval for experiments to be performed at the MHATT CAT APS facility.

MHATT CAT recognizes that Chapter 21-1 of the *ANL Environment, Safety and Health Manual* limits its experiment approval authority to experiments in the *Everyday Routine*, *Routine Laboratory* and *Nonroutine Laboratory* categories². As specified in the *ANL Environment, Safety and Health Manual*, some activities (e.g., use of Class IV lasers) require additional reviews and approvals by ANL, and MHATT CAT will comply with these requirements.

PROCESS OVERVIEW

This guideline describes a process intended to:

² These categories are defined as follows:

- ***Everyday routine*** - hazards that are routinely encountered and accepted in the course of everyday living by the vast majority of the general public (e.g., office use, computer use, Class 1 and 2 lasers, auto use, routine custodial services).
- ***Routine laboratory*** - hazards found in the ANL-E R&D environment that are considered routine and of minimal risk by the scientific community (e.g., Class 3a lasers, routine analytical equipment, electronic calibration equipment, basic machine-shop or craft tools, common solvents, moderate-temperature ovens or heaters).
- ***Nonroutine laboratory*** - hazards found in the ANL-E R&D environment that involve specialized materials, energy sources, or equipment that might present limited and localized on-site impact and negligible off-site impacts to people or the environment (e.g., Class 3b and 4 lasers, pressurized systems, high voltage electrical systems, radioactivity, chemistry laboratories handling significant quantities of flammable liquids or hazardous chemicals).

- Identify and summarize the hazards associated with performing an experiment,
- Define minimum safety requirements for performing the experiment, and
- Document a decision authorizing the conduct of the experiment.

This guideline calls for the experiment safety review to include:

- Hazard Identification
- Risk Evaluation
- Selection and Specification of (Additional) Hazard Controls
- Approval (with acceptance of residual risk)

To ensure its effectiveness, the experiment hazard evaluations will be conducted by MHATT CAT personnel with a background that will enable them to:

- Recognize hazards (as that term is defined above),
- Evaluate their significance,
- Identify required controls, and
- Where control options exist, specify appropriate controls.

MHATT CAT reviewers will also attempt to anticipate hazards not well identified by experimenters.

DESCRIPTION OF EXPERIMENTS

MHATT CAT will require its members, collaborators and independent investigators to provide written descriptions of the experiments they propose to conduct at MHATT CAT's facilities at the APS. The description of the experiment will be provided on or attached to the APS ESAF. The experiment description (and ESAF) may be submitted on paper or electronically.

HAZARD IDENTIFICATION AND ANALYSIS

MHATT CAT Safety Committee personnel evaluating safety concerns associated with proposed experiments will attempt to identify hazards associated with the following:

- Materials (including their transport to the APS),
- Equipment, and
- Processes

MHATT CAT recognizes that an adequate experiment safety review requires a good understanding of the planned experiment and may be an iterative process. Consequently, the CAT will advise users that an ESAF containing relevant hazard information in the above three categories must be submitted along with experiment proposals well in advance of beamtime allocation.

Materials

Experimenters planning to use MHATT CAT's facilities will provide the following information about each material to be used during the conduct of the experiment:

- Its identity,
- The amount of material to be used, handled, disposed, or transported to/from the APS,
- Its physical form, and
- How it will be handled.

Experimenters will also identify the hazards associated with each material, including:

- Toxicity
- Radioactivity
- Flammability (or other fire hazards)
- Corrosivity
- Incompatibility and unusual reactivity
- Temperature concerns (cryogenic liquids)
- Biological activity

Users will also be asked to alert the MHATT CAT to any hazards not listed above.

Equipment

MHATT CAT Safety Committee reviewers will attempt to anticipate the hazards associated with experimental apparatus (not a part of the operating beamline) by applying their previous experience, knowledge and intuition. The reviewers will evaluate concerns such as the following:

Utility Requirements

- Electrical
- Water
- Air pressure
- Ventilation

Hazard Categories

- Contains radioactive sources or produces ionizing radiation
- Produces non-ionizing radiation (radiofrequency, microwave) or strong magnetic fields
- Contains laser(s)

- Contains pressurized vessels, vacuum vessels, or pressure cells
- Supplies or uses electrical current with a potential to ground in excess of 50 volts or flowing at a rate in excess of 15 amperes
- Contains capacitors capable of storing dangerous amounts of electricity
- Contains resistive heating devices
- High temperature (accessible surfaces with a temperature exceeding 150°F)
- Moving parts, nip points, and points of operation (motorized, pressure-driven, not manually driven)
- Noise (Emits sound with a sound pressure level of 80 dB(A) as measured at the nearest accessible point during operation.)

Processes/Operations

Experimenters will attach copies of procedures describing processes and operations they will (or might) perform while working at the MHATT CAT's facilities at the APS. The MHATT CAT Safety Committee reviewer will review these procedures to verify that they are adequate to control anticipated hazards. Common concerns include:

- Use of lasers
- User of x-ray generators
- Use of hoisting and rigging equipment
 - Weight of object to be lifted?
 - Does object have hoisting eyebolts?
 - Lifting equipment brought by user?
- Chemistry, including chemical reactions and changes in physical form
- Release of contaminants into air or water

The MHATT CAT review of the ESAF will address all experimental activities conducted at the APS according to the way the term experiment is defined in Chapter 21-3 of the *ANL Environment, Safety and Health Manual*. MHATT CAT Safety Committee personnel will consider both the likelihood that an identified hazard could cause an undesirable event and the consequences of such an event. In addition, MHATT CAT will identify whether the APS or ANL has specified mandatory control measures applicable to the hazard. Each identified hazard will then be characterized as to whether or not sufficient controls are in place.

SPECIFICATION OF HAZARD CONTROLS

If the MHATT CAT Safety Committee reviewer judges that sufficient controls are not in place, MHATT CAT will specify additional controls that must be put in place

before the work may begin.³ Where possible, MHATT CAT will work with the experimenter to ensure the acceptability and feasibility of the controls. In all cases, unless a formally issued variance has been obtained, all APS- and ANL-required hazard controls will be specified.

Each hazard control measure specified during the experiment safety review will be identified on the ESAF,⁴ or on attachments if more space is required.

USE OF STANDARD EXPERIMENT SAFETY ENVELOPES

An experiment safety envelope is a set of controls, consisting of training requirements, engineered controls, and procedural controls⁵, that is sufficient to provide for the safe conduct of all individual experiments falling into an associated class.

MHATT CAT anticipates that many hazards associated with experiments will fall into a few well-defined groups. Consequently, MHATT CAT has established a number of hazard classes for which it has formulated corresponding *safety envelopes*. Individual experiments that appear to fall into such pre-approved classes will only be evaluated to the extent necessary to establish that they do not exceed the evaluated hazard levels and that they do not introduce other hazards not considered with the class that was evaluated. A separate document describes the standard safety envelopes defined by MHATT CAT.⁶

Before an approved experiment is modified, it will be reevaluated to ensure that it still falls within the previously specified safety envelope. If the safety envelope might not be adequate to reduce associated risk to acceptable levels, a new hazard class will be assigned and experimental work will not continue/begin until appropriate hazard controls are in place.

VERIFICATION REQUIREMENTS

MHATT CAT will require a documented last-minute verification whenever hazard controls cannot be put in place until the last minute. MHATT CAT will also require documented verification when specified measures are intended to control substantial risks, that is, those with higher probability or possibly grave consequences. MHATT CAT personnel authorizing the experiments will specify on the ESAF who should verify that specified hazard controls are actually in place.

AUTHORIZATION

No experiment may be started until formally authorized by a designated individual. The designated individuals for MHATT CAT are the MHATT CAT Sector Manager and the MHATT CAT Safety Coordinator. An attachment to this guideline lists those individuals whom the CAT has so designated.

³ Associated experimental activities that do not create or result in exposure to hazards may be performed before all controls are in place.

⁴ Such specification can be by reference to standard operating procedures, approved safety envelopes, etc.

⁵ For the purpose of this write-up, obtaining reviews, authorizations and approvals will be treated as procedural requirements.

⁶ *Standard Safety Envelopes for Experiments at the MHATT CAT Facility at the APS*

DOCUMENTATION

The MHATT CAT will use the completed ESAF, along with attachments as needed to provide adequate detail, to record and retain the results of each experiment safety review. This documentation must include:

- Identification of the experiment,
- Identification of significant hazards,
- Required hazard controls measures,⁷
- Verification requirements,
- A statement accepting residual risk, and
- The name and signature of the person authorizing the performance of the experiment.

DISCLOSURE

The MHATT CAT will forward a copy of the completed APS ESAF and relevant supporting documents to the APS Experiment Safety Coordinator when the decision is made to approve the proposed experiment. In addition, MHATT CAT will have an APS Floor Coordinator post the original copy of the ESAF and all relevant attachments at the beamline before or at the commencement of the corresponding beamline activities.

FEEDBACK

The MHATT CAT will periodically evaluate the effectiveness of this procedure to determine what changes should be implemented to improve the process. To this end, the MHATT CAT will participate in the Independent CAT Safety Assessment process established by the APS. In addition, the MHATT CAT will consider recommendations made by review committees appointed by member institutions. Moreover, whenever the review process or a specified envelope fails to control a hazard, MHATT CAT will immediately investigate to determine the cause of the failure and what should be done to prevent recurrence. As defined elsewhere in its safety plan, MHATT CAT will inform the APS about incidents involving the failure of the review process or a specified control.

ATTACHMENTS

- APS Experiment Safety Approval Form
- MHATT CAT personnel with Experiment Safety Approval Authority

⁷ I.e., all measures except those that form the basic safety envelope at the APS.

APS EXPERIMENT SAFETY APPROVAL FORM

Completed by Experimenter

NOTE: This form is to be submitted to the CAT. No experiment will be allowed to run until a properly completed and approved experiment safety approval form has been posted by an APS Floor Coordinator. **Approval is valid for a maximum of six months from the CAT approval date.**

Exp. Subject: _____ **Funding Source:** _____ ☐ Classified
 work will be performed _____
(See choices on second page) (See choices on second page)

1. Beamline Station (Sector - BM or ID - station, e.g., 17-ID-B): _____ **Date**
submitted: _____

2. Experiment title: _____

3a. Experiment spokesperson: (Name, Institution, E-mail, and Telephone) _____

3b. List all other experimenters (names and institutions) working at the APS (attach second sheet if needed):

4. Materials List samples& chemicals to be used for on-site preparation and the experiment. Check appropriate boxes regarding known hazards:

Name of material	Quantity	CAS # (if known)	Known Hazards					Dispose at ANL ²
			toxic	biohazard level	flammable	Radioactive	other ¹	
1								
2								
3								
4								

Notes: 1 Describe other known hazards in User comment section. See back of form for hazards definitions.
 2 Check if you plan to dispose of the material at ANL, as either waste or effluent, at the end of the experiment.

☐ additional materials continued on attachment **This experiment will use/require:** ☐ human subjects/material ☐ live animals
☐ on-site chemical preparation

5. Equipment to be used in the experiment that is not a permanent part of the beamline:

☐ cryogenics ☐ furnace ☐ high pressure ☐ laser ☐ high voltage ☐ non-UL listed electrical ☐ other

6. User comments (include special hazards/controls, describe effluents, previous Safety Approval Form Serial Number, Standard Operating Procedures, etc.; ☐ additional sheets attached):

Completed by CAT

☐ Additional sheets attached to detail hazard controls/special procedures.

7. CAT comments (include Safety Envelope(s) that cover this experiment): SE# ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

8. Safety Approval Form Serial Number: (e.g., 1-IDA-97-01)

_____ - _____ - _____
 beamline station year sequence

9. Plans are adequate to mitigate hazards and activities are within the beamline operation safety envelope:

CAT approval: _____
name (print) signature date

Person authorized to verify experiment safeguards: _____
name (print)

Experiment Safeguards Verification

All required controls, training & safeguards are in place to start the experiment (Authorization signature):

name (print) signature date

Subject area of this experiment, per DOE classification scheme (list the number of all categories that apply in the space provided on the form): [note: only the Experiment Safety Approval Form has to be forwarded to XFD and/or posted on the beamline by the Floor Coordinator.]

- | | | | |
|---|--|----|---|
| 1 | Materials sciences (includes condensed-matter physics and materials chemistry) | 7 | Earth sciences |
| 2 | Physics (excludes condensed-matter physics) | 8 | Environmental sciences |
| 3 | Chemistry (excludes materials chemistry) | 9 | Optics |
| 4 | Polymers | 10 | Engineering |
| 5 | Medical applications | 11 | Instrumentation or technique development related to user facilities |
| 6 | Biological and life sciences (excludes medical applications) | 12 | Purchase of specialty service(s) or materials |
| | | 13 | Other: (please specify on front of form) |

Source of support for the experiment. Please list all that apply in the space provided at the top of the Experiment Safety Approval Form.

- | | |
|---|------------------------------------|
| 1. DOE, Office of Basic Energy Sciences | 7. NASA |
| 2. DOE, Office of Biological & Environmental Research | 8. USDA |
| 3. DOE, Other (specify) | 9. Other U.S. Government (specify) |
| 4. DOD, (specify) | 10. Industry |
| 5. NSF | 11. Foreign (specify) |
| 6. NIH | 12. Other (specify) |

Hazard Class Definitions:

Hazard: Any existing or possible condition that, by itself or through interaction with other conditions, has the capacity to cause death, injury, illness, property damage, unacceptable environmental impact, or other losses.

Risk: A quantitative measure (or estimate) of the product of the probability that a hazard will result in ill-effect and the consequence of an ill-effect.

Toxic: Having the capacity to cause death, illness, or diminished function. A material that meets one or more of the following criteria should be considered toxic:

- Has a published LD₅₀ (Lethal Dose 50%) equal to or less than 0.5 g/kg of body weight.
- Has a published LC₅₀ (Lethal Concentration 50%) equal to or less than 1000 ppm.
- Has an OSHA permissible exposure limit (PEL) or ACGIH Threshold Limit Value (TLV) equal to or less than 5000 ppm.
- Has an OSHA PEL or ACGIH TLV equal to or less than 10 mg/m³.

Biohazard: An agent of biological origin (e.g., all infectious organisms, their toxins, allergens of biological origin, and genetic fragments) that has the capacity to cause ill-effects in humans.

Flammable: Susceptible to ignition during storage, normal handling, or use. The term includes, but is not necessarily limited to:

- All materials that ignite spontaneously when exposed to air.
- All gases easily ignited in atmospheres containing approximately 21% oxygen.
- All liquids having a flashpoint below 100°F (38°C).
- All combustible solids and liquids having a physical form that makes them easily ignitable if dispersed into ambient atmospheres.

Radioactive: Any material having a measurable specific activity above background. While on the ANL site, materials with a specific activity ≥ 2 nCi/g must be transported by the ANL Special Materials Group. APS must be notified of any shipment of radioactive materials to/from the site.

Other: Can include oxidizers, corrosives, carcinogens, explosives, and any other hazard not listed.

APS Experiment Safety Envelope Summary

Safety Envelope 1: APS Base Hazard Class
 Safety Envelope 2: Cryogenic Hazards
 Safety Envelope 3: High Temperatures
 Safety Envelope 4: Lasers, Classes 3 and 4
 Safety Envelope 5: High Pressure Systems

Safety Envelope 6: Chemicals
 Safety Envelope 7: Biosafety Hazards
 Safety Envelope 8: Radioactive Materials
 Safety Envelope 9: Other Hazards

MHATT CAT Personnel with Experiment Safety Approval Authority
As Director of the MHATT CAT, I authorize the following personnel to conduct hazard evaluations of experimental activities, to specify required control measures, and to approve such activities once the specified controls have been implemented:

1. Steve Dierker (MHATT CAT Sector Manager)
2. Eric Dufresne (MHATT CAT Safety Coordinator)
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

Roy Clarke
[Name]

[Date]

MHATT CAT Director
[Title]

[Signature]